ELECTRICAL TIMES

THURSDAY
5 NOV.
1953
NINEPENCE

for £5

the 4 ft.

Mazda

MONOLUX

Junior

The new BTH 'Pendicones' for rapid flush mounting.

- *The new BTH Lamp Auxiliary Gear for either 'Switch' Start or 'Instant' Start.*
- *The new BTH Cartoning for easy handling and stocking.*

When the 5 ft. Mazda Monolux was introduced it was hailed as 'the greatest advance in lighting fittings design for years.'

Now comes a junior model for use with a 4 ft. 40 watt fluorescent lamp.

The Mazda Monolux Junior has the same clean lines and other outstanding features that have made its elder brother so popular.

Cat. No. F1004/1/4048 'Switch' Start. Write for leaflet 9602-5 Edition B which gives full details.

Mazda *lamps stay brighter longer*

THE BRITISH THOMSON-HOUSTON CO. LTD., Crown House, Aldwych, London, W.C.2
(*Member of the A.E.I. Group of Companies*)

B T-H

M4457

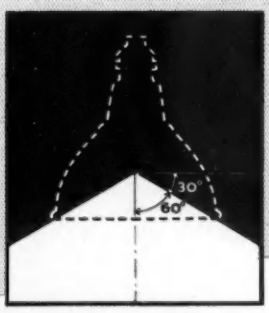
BENJAMIN REGD.

deep bowl reflectors

for Quality Lighting

Benjamin—renowned for quality in industrial lighting—now take a great step forward by introducing the Deep Bowl Reflector. Indeed, this is one of the major advances in quality lighting of modern times. By its increased depth, this reflector provides maximum comfort and clarity of vision.

The illustration shows the Deep Bowl Reflector with Heavy Duty Top and Dustproof Visor. These features should always be specified . . . and remember—first-class lighting demands first-class accessories! Benjamin give you all this and at practically the same cost.



The usual Benjamin 'quality' features, 'Crysteel' vitreous enamel finish, 'Saaflux' Temperature Reducing and easy maintenance, are incorporated.

Our local Engineer is always at your disposal, write or phone for full details.

Better Lighting by

BENJAMIN REGD.

THE BENJAMIN ELECTRIC LTD., BRANTWOOD ROAD, TOTTENHAM, LONDON, N.17

Telephone: TOTtenham 5252 (5 lines) *Telegrams: "Benjalect, Southtot, London"*

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Nife lamps do not deteriorate even when idle for long periods

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NIFE PORTABLE LAMPS

used by the Admiralty for 30 years

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A

MAZE AT HAMPTON COURT

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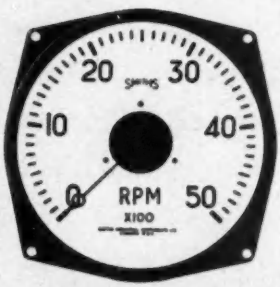

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Work conjointly with a generator for remote indication. Available with 4 in., 6 in. or 9 in. dials. Each instrument is individually manufactured and calibrated.

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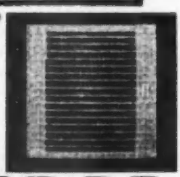

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THE HIGHEST STANDARD OF QUALITY AND PERFORMANCE
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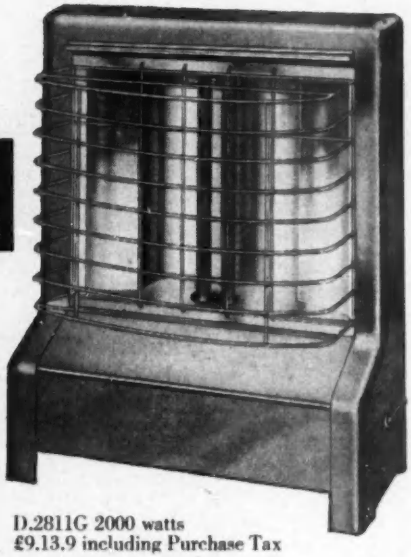
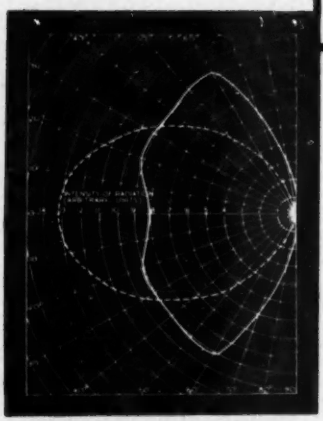


D.2811G 2000 watts
£9.13.9 including Purchase Tax



Distribution of Radiation in a horizontal plane

—— Fires with wide angle reflector
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MULTI-PARABOLA means more heat for everyone

1. Scientifically designed reflector disperses heat evenly.
2. Heat rays, directed into the room at all angles, ensure comfortable heating over a wide area.
3. Pleasing design and brilliant finish give these fires a very handsome appearance.
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They will ask you for Burco—are you ready?

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- ★ HOUSEWIFE
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Burco

the Aristocrats of electric Washday Appliances

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STEEL OR CAST IRON **KIOSKS** *IN ALL SIZES*

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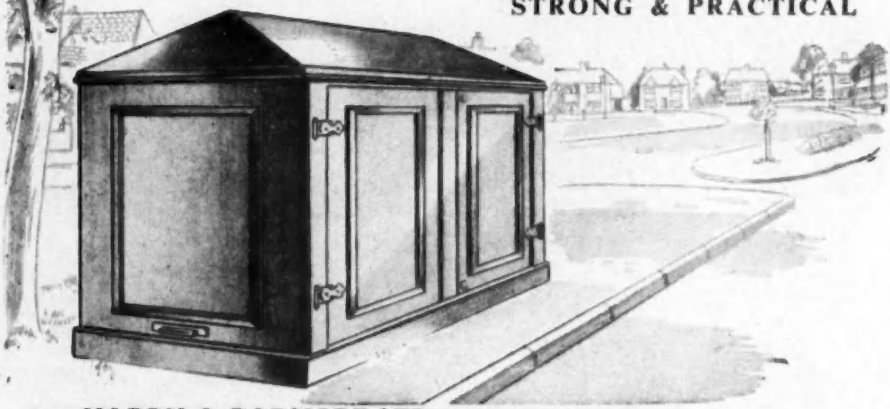

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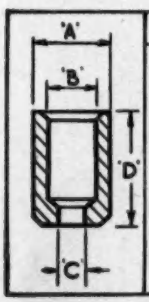

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SIZE	A	B	C	D
001	·187″	·125″	·048″	3/16″
01	·250″	·156″	·070″	1/4″
1	·276″	·187″	·093″	1/4″
02	·312″	·218″	·108″	1/4″
2	·354″	·250″	·140″	1/4″
03	·375″	·281″	·140″	1/4″
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Made for all Standard Sizes of Cables

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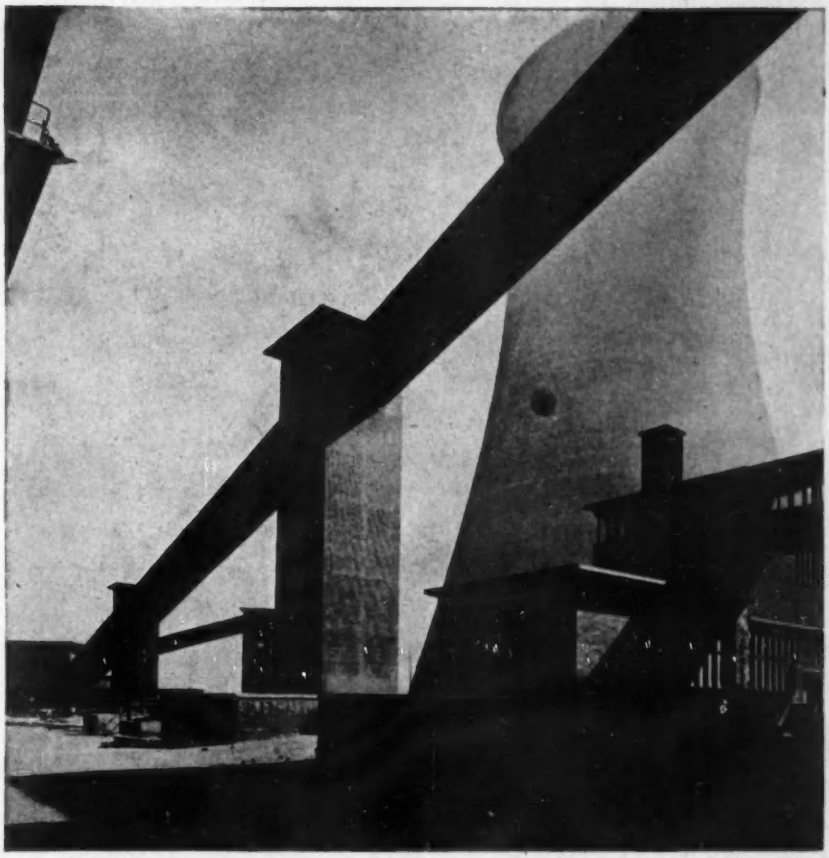

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NOW IN COMMISSION at the Huncoat (Accrington) power station, this coal handling plant is one of many designed and built by Simon-Carves at home and abroad. Wide experience of the mechanical and pneumatic handling of coal, coke, breeze, and many other fuels qualifies Simon-Carves to advise on fuel handling and preparation problems.

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SC101

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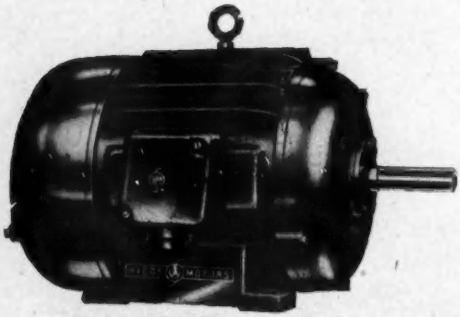

Standardised Dimension
Motors
T.E.F.C. to CN(Elec) 6814
½-25 h.p.

GUARANTEED FOR EVER

Belfast, Birmingham, Bristol, Cardiff, Dundee, Glasgow, Leeds, London, Manchester, Newcastle, Peterborough, Sheffield, Wolverhampton

THE NATION'S REMEMBRANCE

POPPY DAY

British Legion, Haig's Fund, Pall Mall, London, S.W.1

(Registered under the War Charities Act, 1940)

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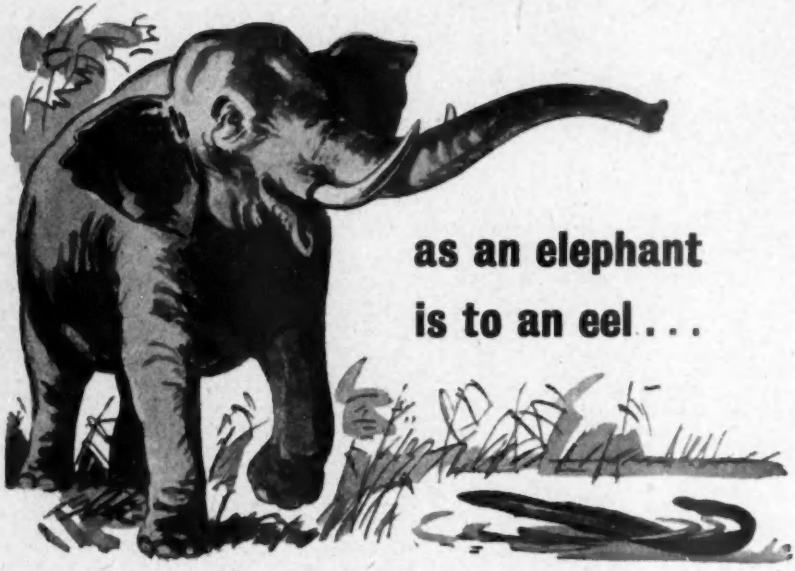

— so is a GENERAL Heavy Duty Trailing Cable to a GENERAL Plastic Insulated Cable. With little surface resemblance, both are characterised by the right degree of strength, toughness and flexibility they need for their jobs. And it's the same with every one of the many standard types of cable which GENERAL manufacture . . . all are cables of quality, durability and fitness for purpose, qualifying our claim that " General Cables today prevent trouble tomorrow ".

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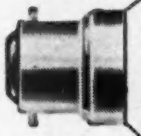
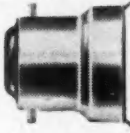


BETTER

ELASTA



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Elasta 5ft. 80w. Warm White and Daylight tubes are now MORE EFFICIENT. The average light output through life has been increased by 12½%

Elasta
LAMPS
AN E.L.M.A. BRAND

Elasta has been famous for reliability and consistent performance for nearly half a century. Always specify Elasta lamps and tubes. Made to appropriate British Standards. An E.L.M.A. brand.

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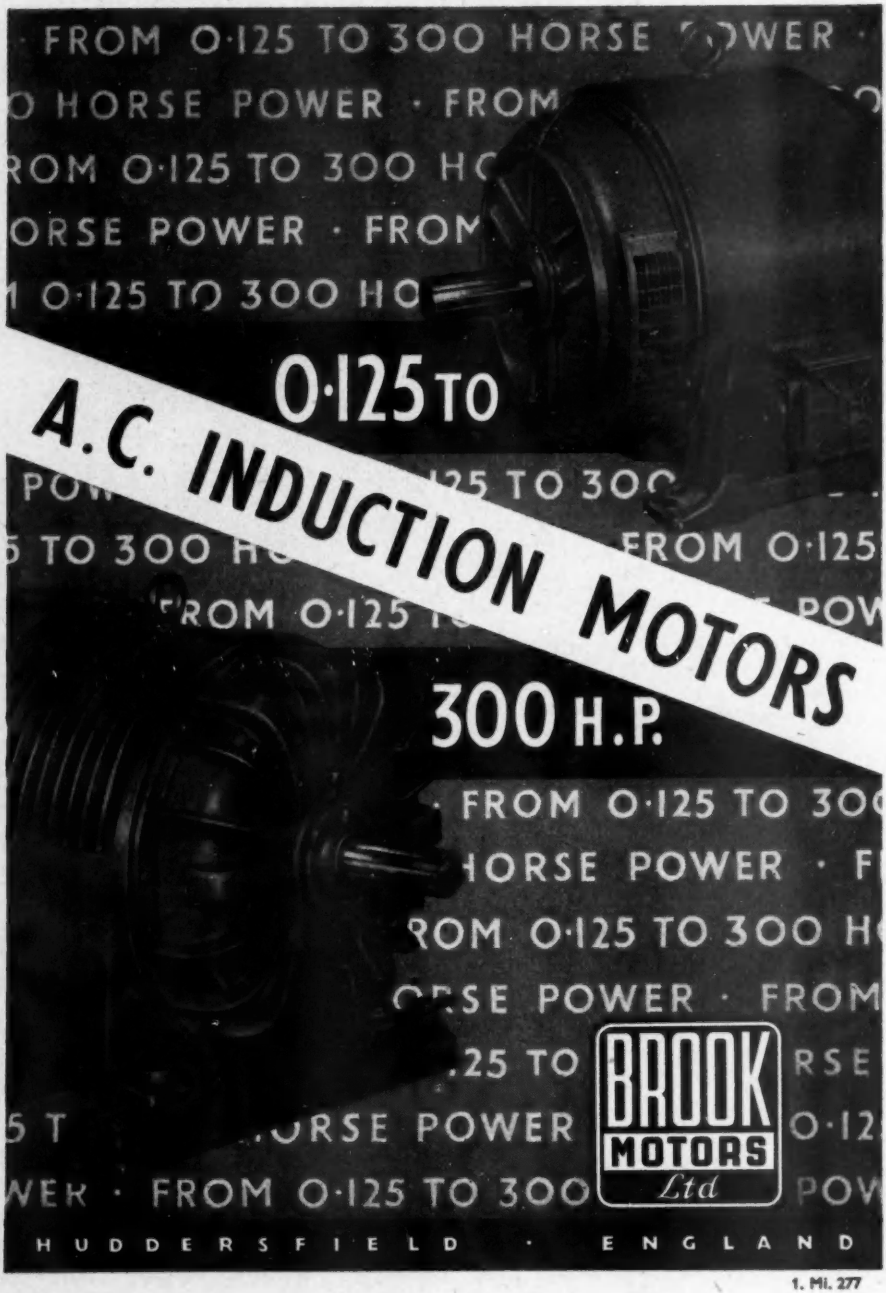
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1. MI. 277

Over 1,000,000 in Africa

. . . over 2 million in use in the United Kingdom and Eire; a million or so in Australasia; half-a-million in Scandinavia; another half-a-million in the rest of Europe and elsewhere—these figures speak for themselves. During the few years that "ARMOURLIGHT" Toughened Glass Insulators have been available, the demand for them has become world wide. Electrically and mechanically they are stronger than any other type of insulator. Laboratory tests and experience in the field have shown them to be proof against puncture by lightning surges and highly resistant to power-arcs. Should failure of the insulator occur, the result is a complete break-up of the glass, but the design is such as to ensure the safety of the conductor, and the damaged unit can easily be seen from the ground. Any "ARMOURLIGHT" insulator that looks sound must be sound.

For technical advice and literature, write to Pilkington Brothers Limited, Insulator Sales Dept., Ravenhead Works, St. Helens, Lancs.

"ARMOURLIGHT"

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PILKINGTON BROTHERS LIMITED

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HVI.3

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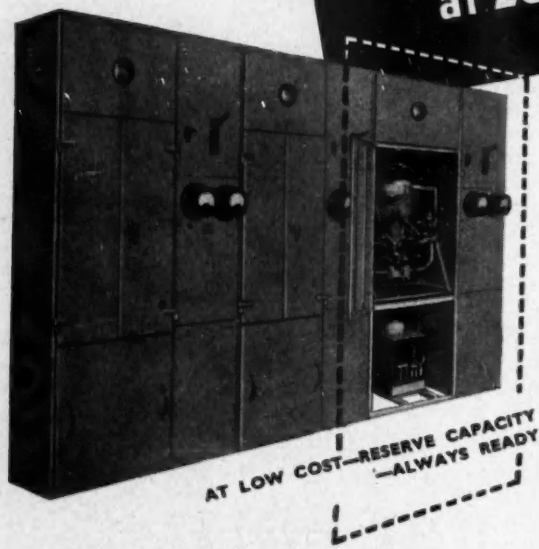
"reserve capacity to ensure continuity of supply"

Consult *Nevelin* for 'CONTINUITY' at LOW COST . . .



The unit construction of Nevelin rectifier equipment enables ample reserve capacity to be provided at minimum cost and size.

In such cases 100% of the rated output is available for 365 days a year, even while routine inspection and maintenance is carried out.

Nevelin technical advisory service is always available on request. For the most efficient answer to power rectification problems it always pays to consult Nevelin immediately.

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Britain's Rectification Specialists

NEVELIN ELECTRIC CO. LTD., PURLEY WAY, CROYDON, SURREY

Telephone: CROydon 2268 **Telegrams: Nevelin Croydon**

A 'LANCASHIRE DYNAMO' COMPANY

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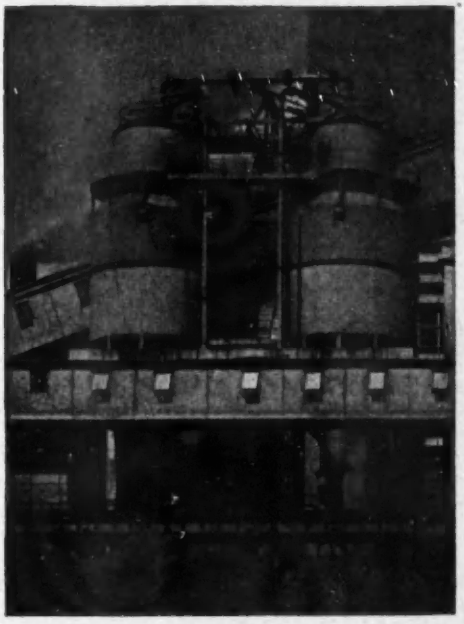
SAVE COST

with - B.V.C

"BRITISH VACUUM CLEANER"

FLUE DUST AND RIDDLINGS

EXTRACTION PLANT



● The Nation's need demands that Coal shall convert every possible fraction of its energy into power for production. The vital contribution that efficient combustion makes to this end is immeasurably facilitated by B.V.C. Flue Dust Removal Plant. This is the recognised method of keeping steam boilers free from accumulations of flue dust, and ensuring that every ton of coal is used to the best possible advantage by removing and consuming the riddlings.

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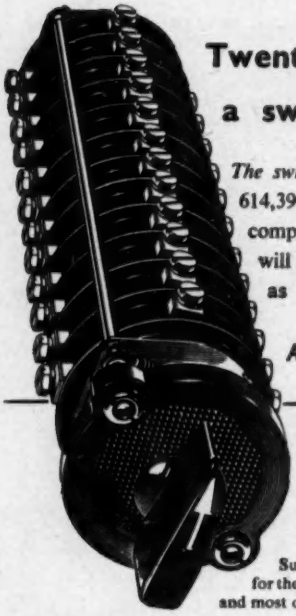
Terminal House, 52 Grosvenor Gardens, London, S.W.1. Sloane 9975/8. Head Office: Leatherhead Surrey



Twenty-four 22.5 kVA Circuits on a switch that will lie in your hand

The switch is a 6 cell Austinlite 50. Its 24 pairs of contacts provide 614,390 different switching combinations—which gives some idea of the complexity of the circuiting these switches handle. The smaller A30 will handle up to forty-eight 7.5 kVA circuits—and is as versatile as the A50. Send for illustrated leaflet giving full particulars.

A Chance PRODUCT

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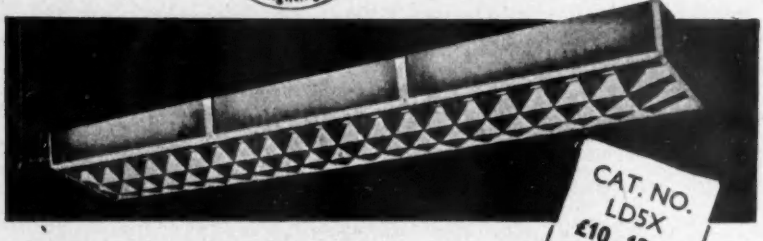
London Office : 28 St. James's Square, S.W.1. Whitehall 6002

Austinlite switches are used and specified by :
The Admiralty ; British Electricity Authority ; The Air Ministry ; Ministry of Supply ; British Broadcasting Corporation ; General Post Office ; Crown Agents for the Colonies ; National Physical Laboratory ; Royal National Lifeboat Institution, and most of the leading electrical manufacturers in Great Britain.

ANOTHER fluorescent MORLITE lighting WINNER . . . . . .



5ft. 80watt Twin Decorative Louvred Fitting

The LD5X has been specially designed to meet a growing demand for a reasonably priced decorative louvred fluorescent fitting. It is particularly recommended for departmental stores, shops, showrooms and offices, etc. Fully guaranteed for two years. Generous trade discounts.

Illustrated catalogue describing complete range of fittings, free on request

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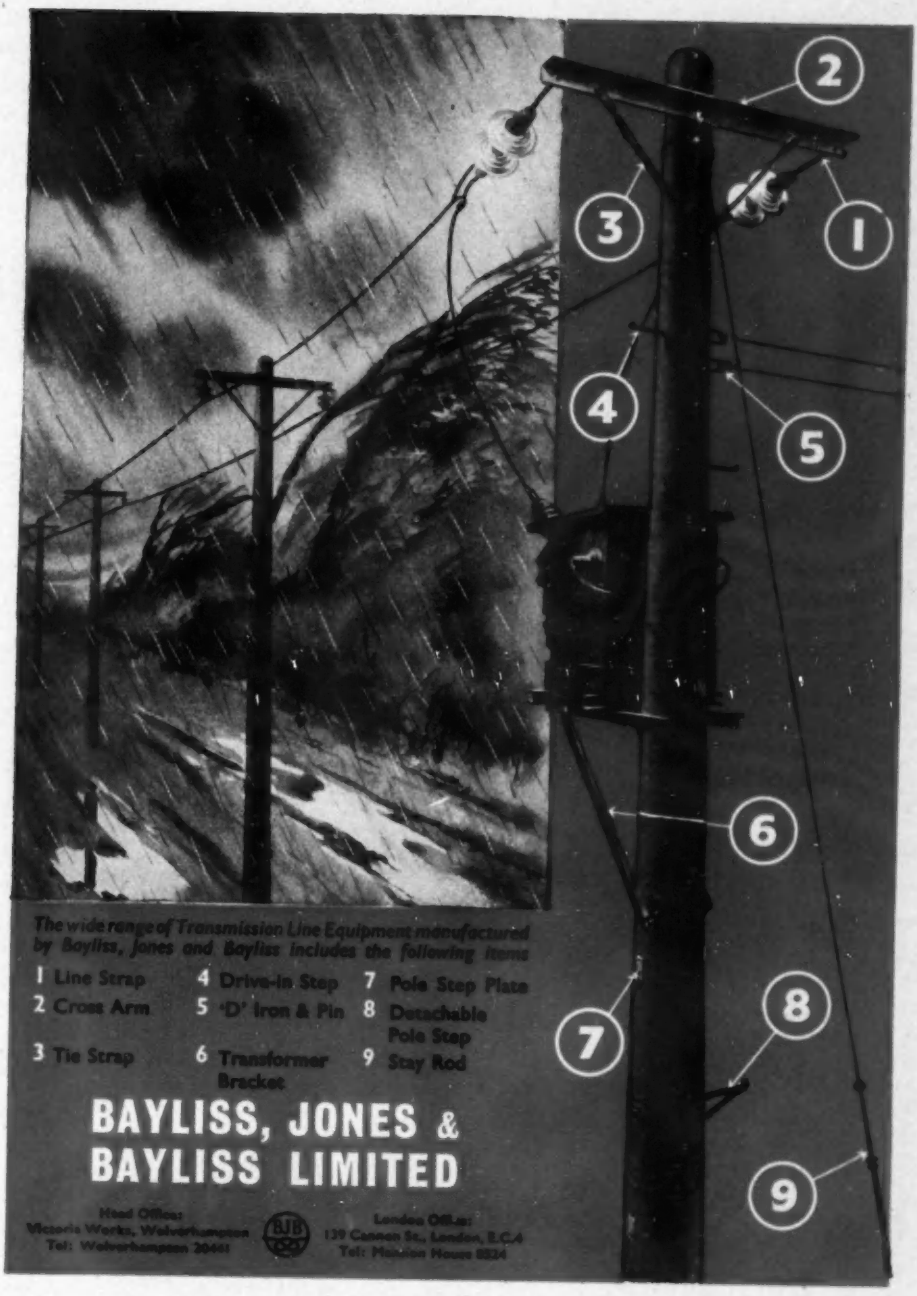

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1 Line Strap
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BJB

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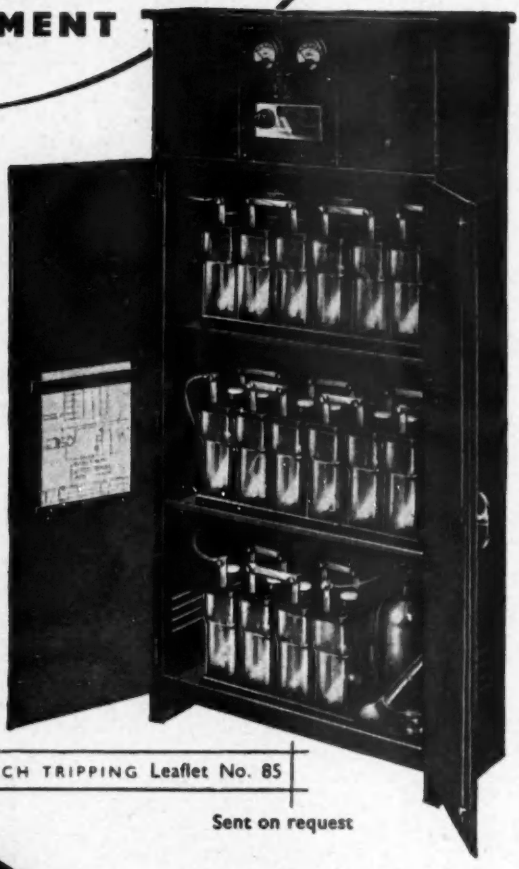
Tudor
SWITCH TRIPPING EQUIPMENT

REMEMBER POPPY DAY

Here is a completely reliable equipment, designed by Tudor for small installations where the battery is required only for tripping circuit breakers, usually at a pressure of 24 or 30 volts.

The cabinet, which may be of wood or steel, houses the battery and accessories and incorporates a trickle charge rectifier and test circuit.

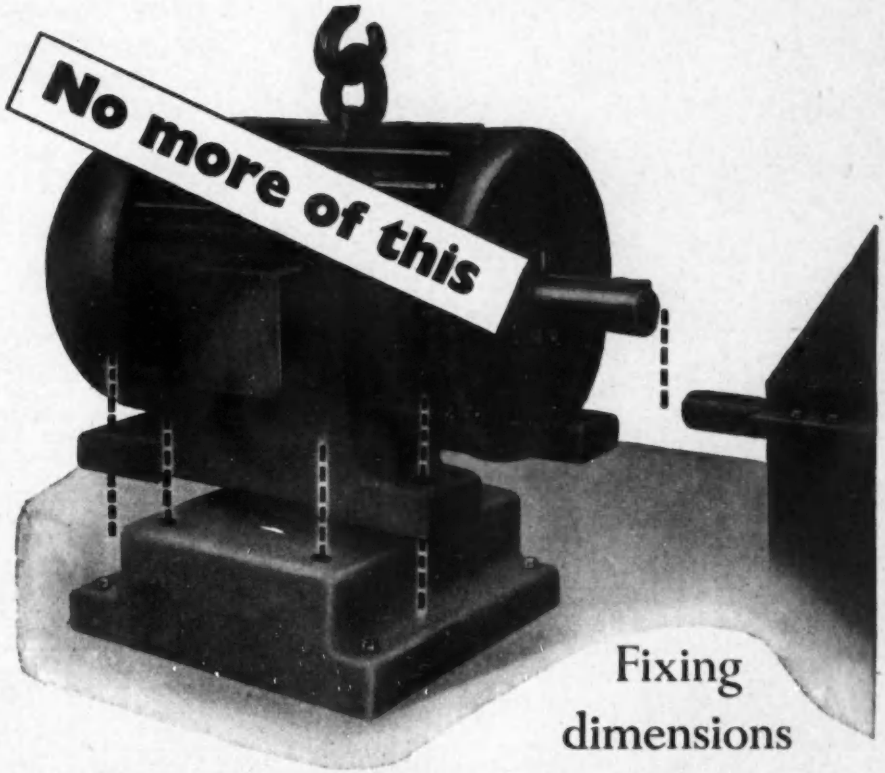


Full details in TUDOR SWITCH TRIPPING Leaflet No. 85 Sent on request

T.113

Tudor BATTERIES

THE TUDOR ACCUMULATOR COMPANY LTD · 137 VICTORIA STREET · LONDON · SW1



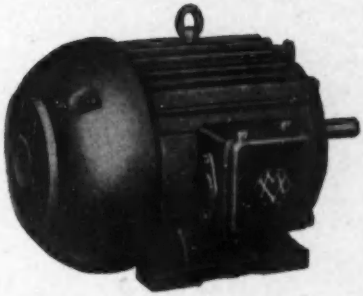
Fixing dimensions standardized

Leading motor manufacturers in this country have collaborated in the design of a range of totally-enclosed fan-cooled, foot mounting, squirrel cage motors having outputs from ¾ h.p. up to 25 h.p. These machines, rating for rating, will all be built to the same leading dimensions which will be laid down in a British Standards specification. This move to standardise motor fixing dimensions meets a widespread demand and will ensure that when motor replacement is necessary, lost production time is reduced to a minimum.

METROVICK are manufacturing a new range of machines which comply fully with British Standard Draft Specification CN(ELE) 6814. The M.V. range is known as:

TYPE KNB MOTORS

Send for Descriptive Leaflet 26/1b-1



One of the totally enclosed, fan-cooled, Type KNB motors with standardized fixing dimensions.

METROPOLITAN - VICKERS ELECTRICAL COMPANY LIMITED, TRAFFORD PARK, MANCHESTER 17

Member of the A.E.I. group of companies

METROVICK ***motors ready for world-wide service***

J/A 201

Follow this man!

He is the 'Bostik' Man whose wide experience of adhesion and sealing in all industries will be of invaluable assistance to you. What he is anxious to do is to give you a realistic picture of how 'Bostik' Adhesives and Sealing Compounds can save you man-hours per job, cut production costs, step up production on efficiency. The 'Bostik' man is a specialist in solving tough problems of adhesion and sealing . . . and some have been very tough nuts indeed. It costs absolutely nothing to call in the 'Bostik' Man. Think what he might save you in production costs and headaches . . .

Bostik

ADHESIVES AND SEALING COMPOUNDS

Write to B. B. CHEMICAL CO. LTD., Ulverscroft Road, Leicester. *The word 'BOSTIK' is the registered trade mark of B. B. CHEMICAL CO. LTD.*

Steam leakage means wasted fuel . . . stop it with a

Crockatt VALVE RESEATER

This tool makes valves tight without disturbing the pipeline and can be operated by one man. Self-centring and suitable for flat or mitred seats, it gives a true face, free from knurling, in a few minutes. Moderate in price—write for full details.

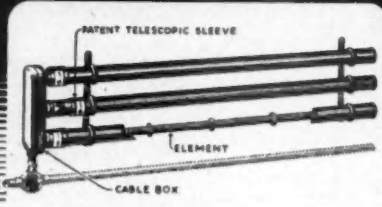
ALSO: Feed Water Filters; Electric Salinometers; Boiler Tube Brushes; Floor Sanders; Terrazzo Polishers; etc.

W. CROCKATT & SONS LIMITED

79 DARNLEY STREET, GLASGOW S1, SCOTLAND

'ARORA' *electric*

TUBULAR HEATING



For Heavy Duty and Long Life—

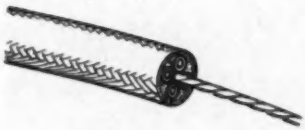
WITH THE PATENT TELESCOPIC SLEEVE TO ALLOW EASY ACCESS FOR WIRING

The ARORA *Company*

ROSEBERY STREET, LOUGHBOROUGH

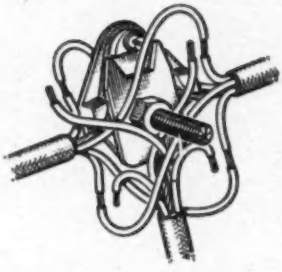
Specialists for over 30 years

204



This is the strand (catenary)

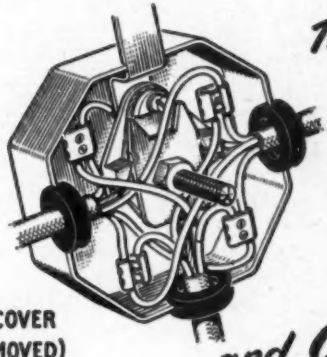
That's held in the clamp



Between the conductors (no cutting of cores)

That fit in the box

That's part of the system



(TOP COVER REMOVED)

That saves **TIME LABOUR MONEY...**

and **CUTS OUT CONDUIT**

Our engineers will gladly co-operate with you.

THE ENFIELD

GRID SUSPENSION SYSTEM

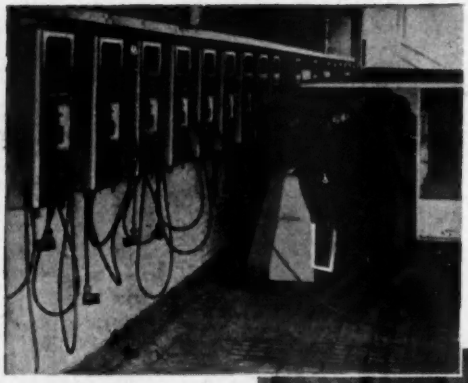
ENFIELD CABLES LIMITED · BRIMSDOWN · MIDDLESEX

HOWard 2661 (Works) London Office: HOLborn 9292

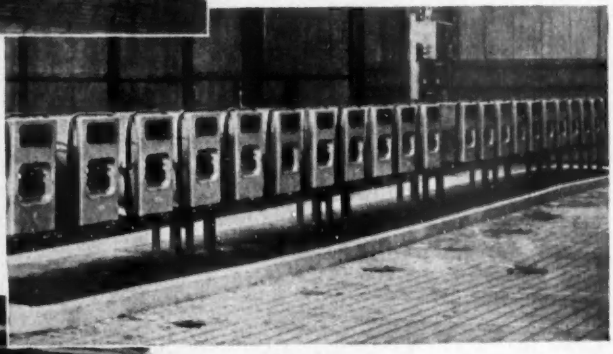
Enfield

1,250 Westalite Battery Chargers Type VZ.15/30

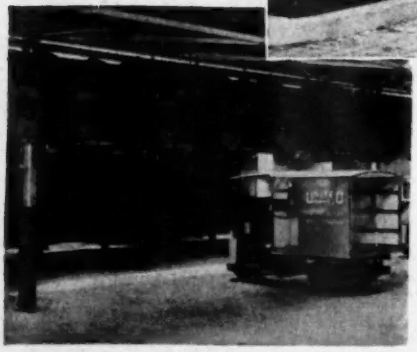
ORDERED BY UNITED DAIRIES



One hundred per cent Westinghouse charging equipment has been ordered by the United Dairies to charge the D.P. Kathanode 259 ampere hour batteries of their 1,250 new Wales & Edwards electric vehicles. The battery charger type VZ.15/30 rated to charge 15 cells at up to 30 amperes was specially designed for the job and, like all Westinghouse chargers, conforms to the battery manufacturers' specifications. The Westinghouse range of chargers is extensive and caters for all vehicles from the PCV up to the 2 ton driven type.



(Top) Westalite chargers at Thornton Heath. (Centre) Lee Green and (Bottom) Tulse Hill depots of United Dairies. (Photographs by courtesy of Mickleover Transport Ltd.)



WESTINGHOUSE

WESTALITE

VEHICLE CHARGERS

Write for Publication M.R.11 to Dept. E.T.23

WESTINGHOUSE BRAKE & SIGNAL CO. LTD., 82 YORK WAY, KING'S CROSS, LONDON, N.1

. . . for Industry and the Domestic Trade

VYBAK Plastics, produced in the new plant of Bakelite Limited, at Aycliffe, County Durham, include

EXTRUSION COMPOUNDS

Vinyl compounds for many electrical and industrial applications including cable covering, sealing strips, hose, etc.

MOULDING COMPOUNDS

Rigid and flexible grades for vacuum cleaner parts, grommets, light reflectors, etc.

PRESSED SHEET

Rigid and flexible grades used for washers, gaskets, chemical tank linings, etc., and in clear grade for inspection windows, etc.

RESINS

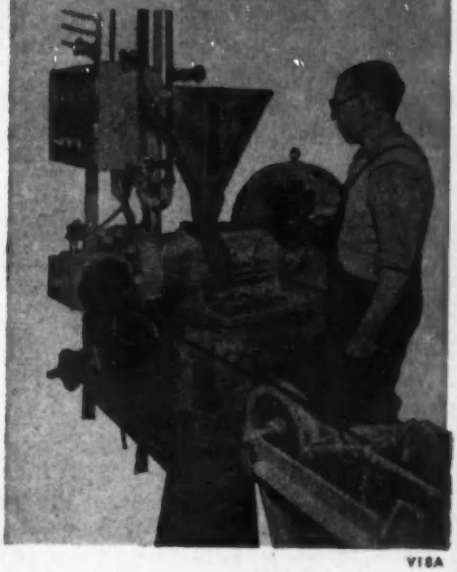
For surface coating, compounding and calendering.

VYBAK Plastics

Write or 'phone for samples and data or call at

BAKELITE LIMITED

12-18 Grosvenor Gardens, London, SW1 Sloane 0898



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announce **Price Reductions**

IN PLUGS & SOCKETS TO BS.1363

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		NOW	
Fused plug, standard brown finish	DS 16	40s. 0d.	per dozen
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Flush type socket, brown plastic front plate	DS 17	46s. 0d.	
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Spare fuses to BS. 1362 (3, 7 or 13 amps.)	DS 20	6s. 0d.	

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Electrical Insulation

It will pay you to send us your enquiries for all types of Micanite Insulations.

We can assist you by maintaining a High Standard of Quality at Competitive Prices.

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Telephone:
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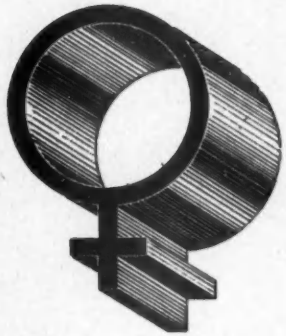

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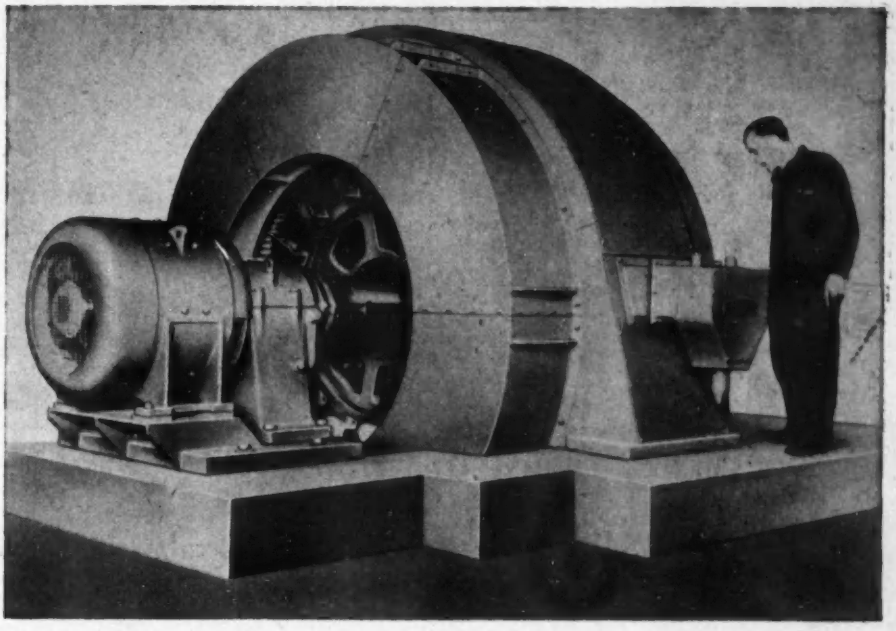


For efficient power generation

Brush Alternators embody the results of the extensive experience which the Company has built up during the past seventy years in the design and manufacture of Electrical Rotating Machinery, and complete Generating Plant for large Power Stations.

The machine illustrated, which embodies robust fabricated construction, has an output of 2,500 kVA—11,000 volts at 428 r.p.m., and is one of a number of Brush Alternators built for the Isle of Man Power Station.

We are in a position to offer quick delivery of a range of our large Alternators and also synchronous Motors, full details of which will be sent on request.

Our full range covers outputs of 3 to 3,000 kVA.

Alternators by BRUSH

THE BRUSH ELECTRICAL ENGINEERING CO., LTD., LOUGHBOROUGH, ENGLAND

Birmingham · Bristol · Cardiff · Glasgow · Leeds · London · Manchester · Newcastle · Sheffield

B.10

C'est magnifique . . .

MAIS CE N'EST PAS LA GUERRE . . .

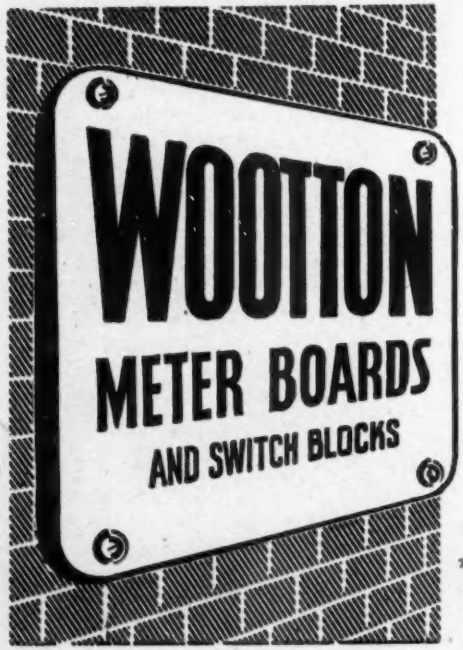
What does it mean? Who said it? Does it matter? It simply expresses, ASTRAL-Ogically, our conviction that this is no war against rising prices . . . it is a massacre.
The famous little 38 guinea ASTRAL brought refrigeration home to countless families who can still hardly believe their good fortune . . . NOW the highly competitive FREESTANDING model will turn the ice-cold war into a rout . . . route it through your showrooms. And the price? That is the spearhead of attack: wait for it:—

£44. 18. 0. (tax paid) . . . . C'est magnifique.

★ **National advertising between November 30 and December 12 in the Daily Mirror, Daily Mail and the Daily Express will support this AND the now famous table top ASTRAL you sell so well . . . Make sure you have them both on display.**

THE NEW
FREESTANDING
Astral **REFRIGERATOR**

PRODUCT OF ASTRAL EQUIPMENT LTD., 96 BUCHANAN STREET, GLASGOW C.1

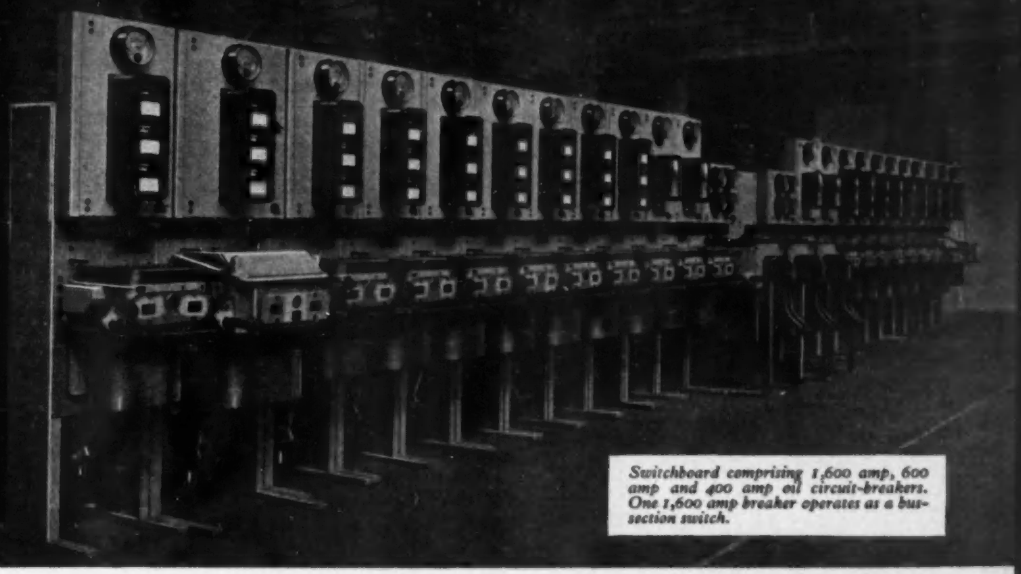


We have been making and supplying the Electrical Industry with METER BOARDS and Switch Blocks for over 27 years.

- *FIRST CLASS WORK*
- *QUICK DELIVERIES*
- *COMPETITIVE PRICES*

We invite your enquiries

WOOTTON & CO., LTD.
ALMA WORKS, PONDERS END, MIDDX.
TELEPHONE: HOWARD 1858
L1048A



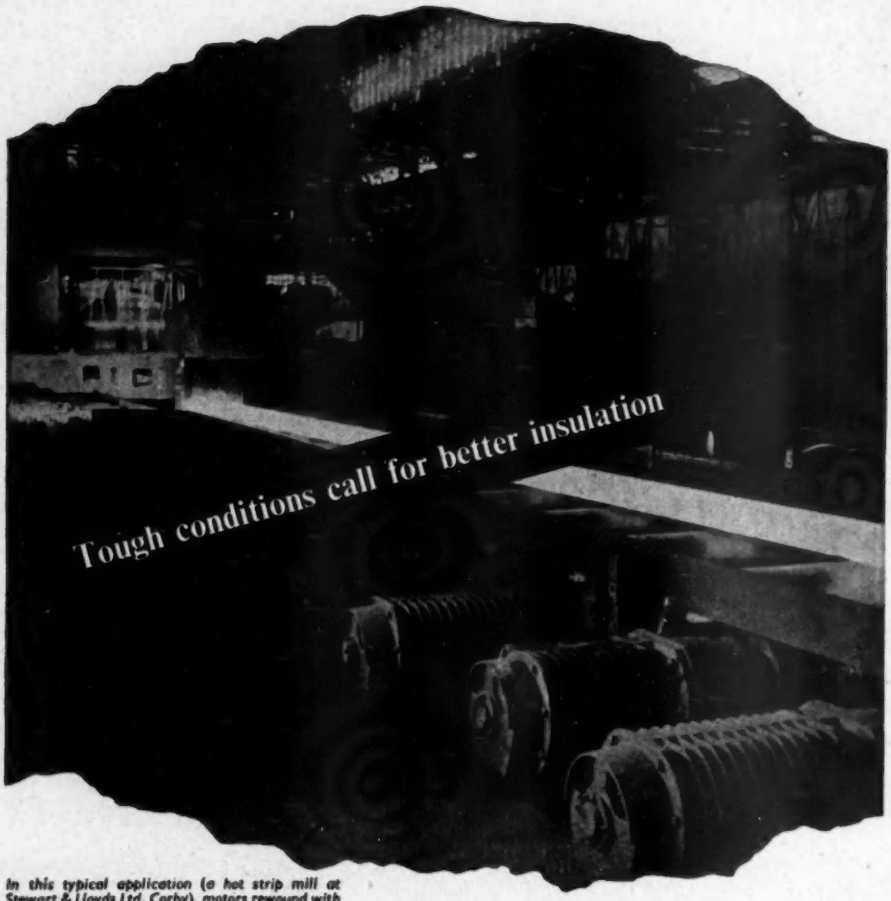
Switchboard comprising 1,600 amp, 600 amp and 400 amp oil circuit-breakers. One 1,600 amp breaker operates as a bus-section switch.

J. & P. LOW VOLTAGE SWITCHGEAR

These two switchboards supplied to the Iraq Petroleum Company are typical of J. & P. low voltage oil-break switchgear. Designed and A.S.T.A. certified for ratings up to 2,000 amp, 30 MVA, this gear can be supplied with horizontal isolation if required. Power closing mechanisms are available for the higher current ratings and rupturing capacities.

JOHNSON & PHILLIPS LTD., CHARLTON, LONDON, S.E.7

Duplicate busbar L.T. Switchboard having off-load bus-selector switches and using 1,000 amp and 400 amp oil circuit-breakers.



In this typical application (a hot strip mill at Stewart & Lloyds Ltd. Corby), motors rewound with silicone-bonded insulation have been introduced.

Where high ambient temperatures and tough operating conditions increase the probability of insulation breakdown, silicone-bonded insulation is the answer. Silicone-insulated motors have **at least 6 times longer life.**

MIDLAND SILICONES

An associate of Albright & Wilson Ltd.

for British made Silicones

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SPECIALISED ATTENTION

"Dear Sirs,

For the past ten years we have obtained the castings for our Mark 16 metal spraying pistols from you. The vital close-grained structure with freedom from porosity are essentials to our product, and are the basis of a precision tool. The high standard of finish which we are able to obtain has been extremely satisfactory to ourselves and our customers in all parts of the world."

METALLISATION LIMITED

Much of our customers' satisfaction is the result, we believe, of the specialised attention given by every department throughout every stage of production. In addition, Birmal offer you a Design Consulting Service, unbiassed assistance in selecting alloy and casting process, and a wide choice of specification. All of which *extra* facilities are part of the Birmal Service.

YOU GET MORE THAN A CASTING FROM BIRMAL

BIRMINGHAM ALUMINIUM CASTING (1903) CO. LTD. BIRMID WORKS · SMETHWICK · BIRMINGHAM 40

Are you cashing

PLUS
all the great selling features:
POWER WRINGING
POWER DRAINING
VITREOUS ENAMELLED CONTAINER
8 to 9 lb. WASHING CAPACITY
POWER IRONING & TABLE TOP (optional attachments at extra cost)

The ENGLISH ELECTRIC Company Limited

See the English Electric advertisement.

in on the...

nation-wide advertising

which is now putting over

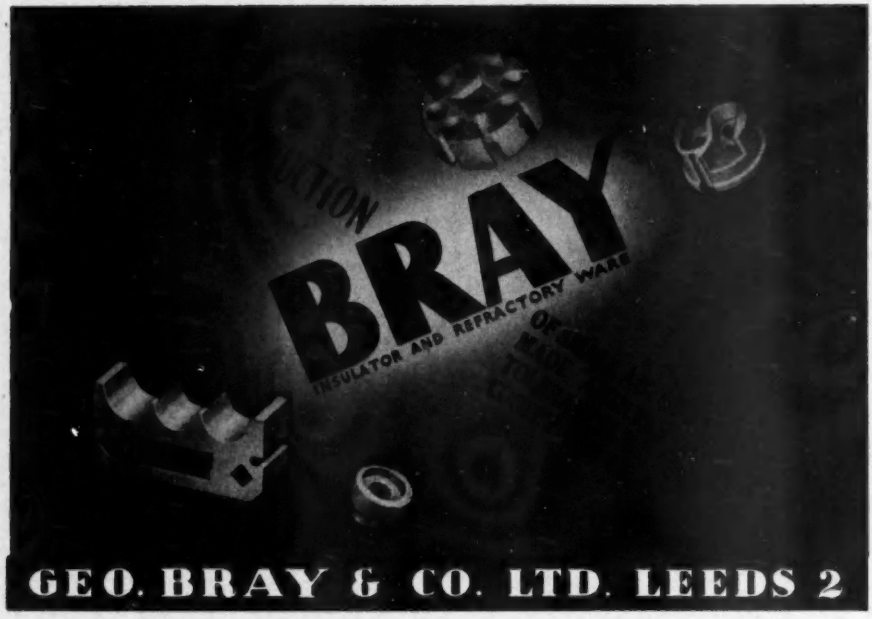
THE NEW PRICE OF

'ENGLISH ELECTRIC'

WASHING MACHINES

Domestic Appliance Division, East Lancashire Road, Liverpool, 10

which appears on pages 44 and 81 of this issue



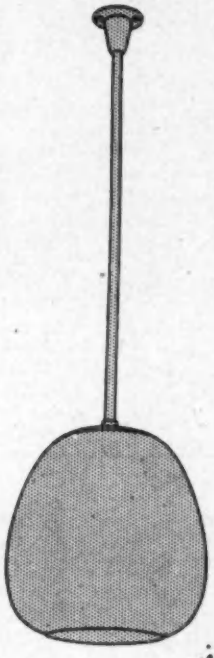
The long, thin, insulated nozzle makes it possible to blow out dust from the most awkward corners of electric switchgear, motors, electronic equipment and other plant, even when "alive." A selection of five machines of various sizes is available to cover all kinds of work where either a blower or a portable vacuum cleaner is required.

Martindale Portable Blowers are of first class construction and guaranteed for a year against faulty workmanship. Supplies from stock.

MARTINDALE ELECTRIC CO. LTD., 45 WESTMORLAND ROAD, LONDON, N.W.9

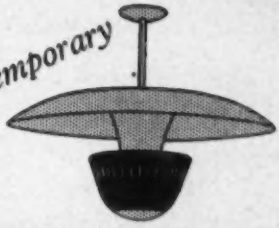
Also at 25 ELMBANK STREET, GLASGOW C.2

Lighting Fittings by FALKS
FALK, STADELMANN & CO. LTD.

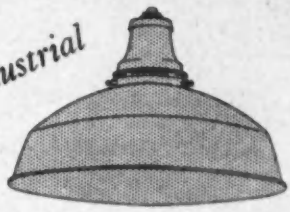


Commercial

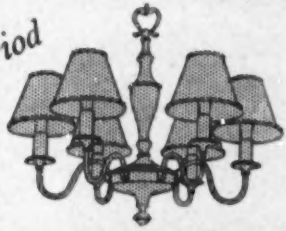
Contemporary



Industrial



Period



See the comprehensive range of electrical fittings for every industrial, commercial and domestic purpose on display at

OUR SHOWROOMS

20 22 MOUNT STREET, PARK LANE, W.1. *Telephone:* MAYFAIR 5671 2

We will serve *your* customers on your behalf

AND IN GLASGOW, MANCHESTER, BIRMINGHAM, DUBLIN, CARDIFF, SWANSEA, NEWCASTLE ON TYNE, LEEDS, LIVERPOOL, BRADFORD, NOTTINGHAM, BRIGHTON, NEWCASTLE UNDER LYME, SOUTHAMPTON, EDINBURGH, ALSO OVERSEAS

FALK, STADELMANN & CO. LTD., 91 FARRINGDON ROAD, LONDON, E.C.1

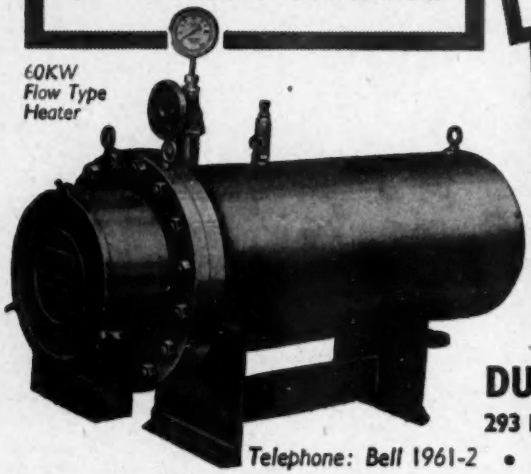
"Dunlow" ELECTRIC OIL HEATERS
SAFE · EFFICIENT · ECONOMICAL

SAVE MONEY by using the lower-priced heavy oils preheated by means of "Dunlow" Electric Line and Immersion Heaters.

WE SPECIALISE in the manufacture of heaters to meet individual requirements. Loadings 1 kW to 300 kW. Fully automatic for low- and high-pressure systems.

APPLICATION: Main Storage Tanks, Oil Separators, Daily Oil Supply Tanks, Lubricating Oil Purifiers, Pipe Line to Burners, Diesel Engines, etc.

60KW Flow Type Heater



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Telephone: Bell 1961-2 • Telegrams "Immerser Glasgow"

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INDUSTRIAL HEATING APPLIANCES AND RESISTANCE UNITS

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COMMERCE ESTATE, SOUTH WOODFORD
LONDON, E.18
Tel.: Buc. 6601/2.

"SANDASTEEL"
A completely new range of medium pressure industrial fuseboards designed for the most modern school of thought
by
SANDERS
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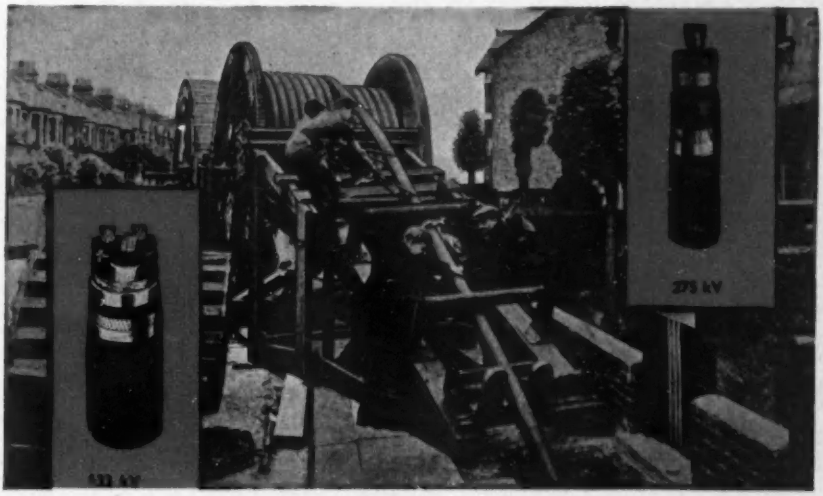
FULL RANGE now available in 15 amp. 30 amp. & 60 amp sizes
The highly competitive prices will be sent on request



BICC supply every type of HIGH VOLTAGE CABLE up to 275kV

As the World's largest manufacturers of electric cables, BICC have had unrivalled experience in the development, manufacture and installation of cables for High Voltages—including Solid, Impregnated Pressure and Oil-filled types.

BICC were the first to develop a 3-core 132 kV Impregnated Pressure cable. The illustration above shows our engineers installing a cable of this type in London. This major project, recently completed for the British Electricity Authority, covers a ten mile route between Barking and Ilford. Two 3-core 0.6 sq. in. 132 kV cables, continuously rated at 120 MVA, were laid. A similar scheme—the first of its kind in the Southern Hemisphere—is at present being installed by BICC in Australia.

Many important Impregnated Pressure and Oil-filled cable contracts have been carried out by BICC over the voltage range 33 kV to 264 kV. In the 33 kV range we have introduced the use of aluminium sheathing for Impregnated Pressure cables—20 miles of this type having been commissioned during the last two years.

Meanwhile our research laboratories have developed 275 kV single-core cables, both Impregnated Pressure and Oil-filled, intended for use in conjunction with Great Britain's new super-Grid.

The World's Largest Cable Manufacturers

BRITISH INSULATED CALLENDER'S CABLES LTD. BI Callender's 21, BLOOMSBURY STREET, LONDON, W.C.1

Volex

THE PLASTIC SHADE MANUFACTURERS NOW INTRODUCE

In introducing the Range of Volex Electrical Accessories, every endeavour has been made by our development and designs department to produce Accessories of a superior quality, which will provide utmost reliability under extreme working conditions.

The needs of the wiring contractor have been closely studied, for all wiring terminals are of generous dimensions and easily accessible.

Samples forwarded on request.

TO BRITISH STANDARD SPECIFICATIONS

★ *Superior Quality*
★ *Utmost Reliability*
★ *Superlative Design*

Volex VOLEX ELECTRICAL PRODUCTS LTD
SALFORD 6

Telegrams: "VOLEXPROD" Salford 6

Further Illustrations
From our range of over 300

Porcelain Ceiling Rose

Top Entry
Porcelain Switched
Socket

A SELECTION FROM
THE RANGE OF

CLANG

CRICKLEWOOD - LONDON
'Phone Gladstone 4201—P.B.X. Board

HIVAC
INDICATOR
LAMPS

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for
ELECTRICAL EQUIPMENT

ACTUAL SIZE

Hivac Ltd

GREENHILL CRESCENT, HARROW-ON-THE-HILL
MIDDLESEX Telephone: HARrow 2655

To Settle your Resistance Problem Contact

RESISTANCES Ltd.

Phone:
ARChway 2155

30 OXFORD ROAD, FINSBURY PARK
LONDON, N.4

The Homeberry

This, the lowest priced of all Magicoal fires, has a Warm Silver finish with polished reflectors and special safety guard. Even including Purchase Tax, the Homeberry retails at the mass market price of only £13. 18s. 2d. (List: £8. 19s. 6d.)

The customer with *twenty* pounds in his pocket and a Magicoal in mind has a really fine choice—*and* some cash to spare. For there are five Magicoal and Berrylog fires retailing from £18. 8s. 2d. *downwards*. These splendid fires (which all have the full Magicoal effect) cost less simply because they are easier to produce. Workmanship, design, heating efficiency are all to Berry's standards.

Touchbutton House, Newman St., London, W.1. MUSeum 6800

Berry's ELECTRIC LTD

NEW YORK · EDINBURGH · MANCHESTER · LEEDS · BIRMINGHAM · NEWCASTLE · EXETER

'ENGLISH ELECTRIC'

h.r.c. fuse links

ASTA CERTIFIED

The Association of Short Circuit Testing Authorities (ASTA) issues Certificates of Rating for fuses giving satisfactory performance when tested in accordance with the appropriate clauses of British Standard 88.

The complete range of 'ENGLISH ELECTRIC' Type 'T' High Rupturing Capacity Non-Deteriorating Cartridge Fuse Links has been ASTA certified for Category of Duty 440AC4 to the 1939 edition of B.S.88 (the highest category at that time) and for Categories of Duty 440AC4 and 440AC5 representing 25 MVA and 35 MVA respectively to the 1947 edition of B.S.88.

RATING AMPS.	LIST NOS.	ASTA CERTIFICATE NUMBERS		
		B.S.88: 1939	B.S.88: 1947	
		440 AC 4	440 AC 4	440 AC 5
30	T1A30	617	1016	2074
60	T1S60	616	903	2022
100	TC100	615	932	2021
200	TF200	251	933	2033
300	TKF300	252	934	2032
400	TM400	629	935	2031
500	TT500	354	936	2025
800	TLT800	353	2098	2026

The ENGLISH ELECTRIC Company Limited

QUEENS HOUSE, KINGSWAY, LONDON, W.C.2

Fusegear Works: East Lancashire Road, Liverpool 10

Works: STAFFORD · PRESTON · RUGBY · BRADFORD · LIVERPOOL · ACCRINGTON

F.7

See also the English Electric advertisements which appear on pages 34, 35 and 81 of this issue

Sen Ter Cet
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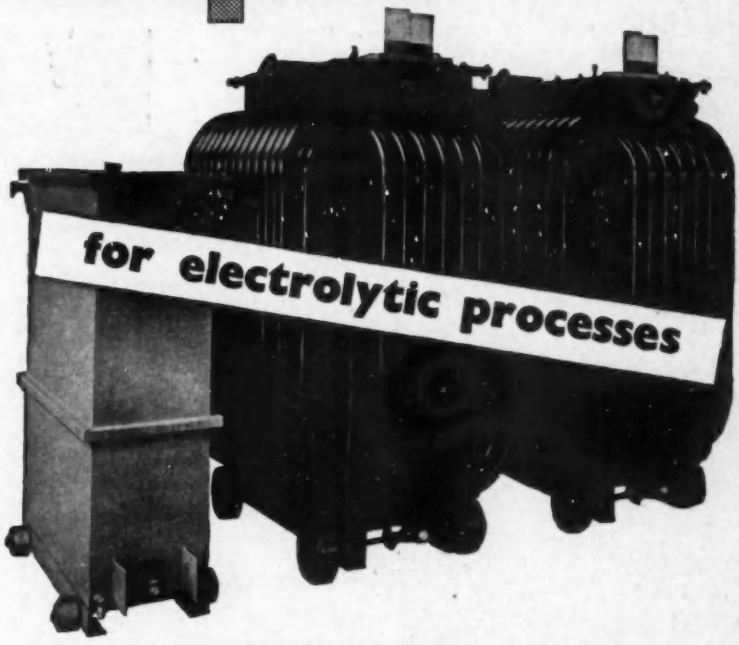

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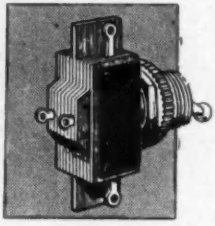

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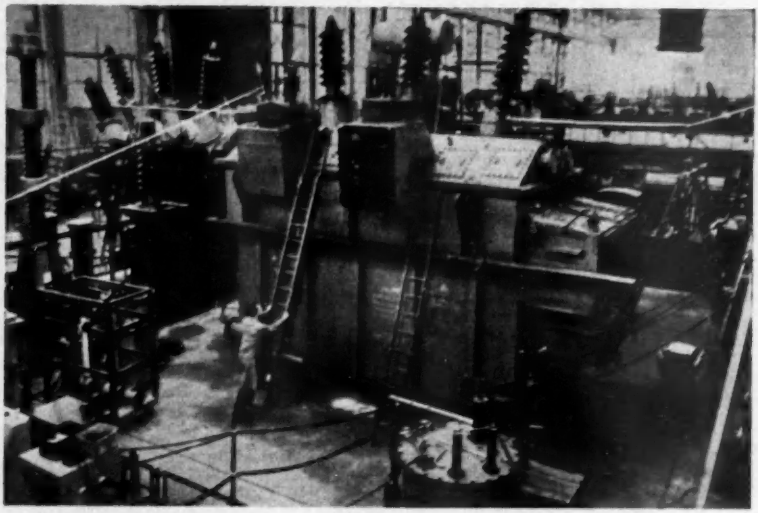

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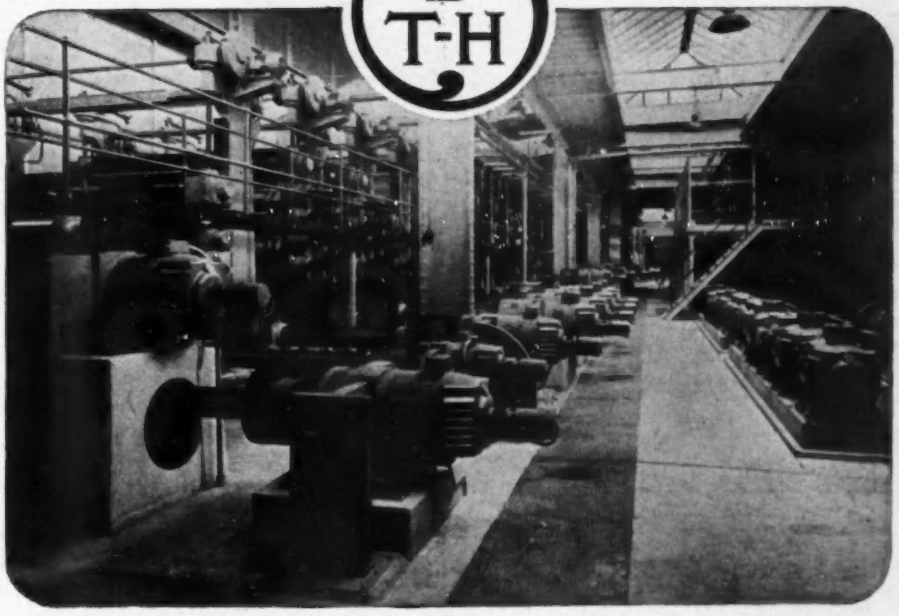

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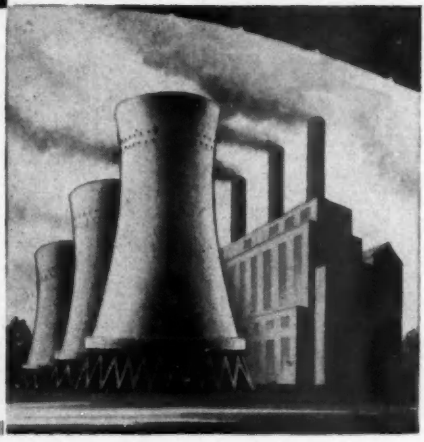

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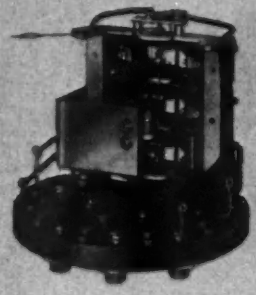

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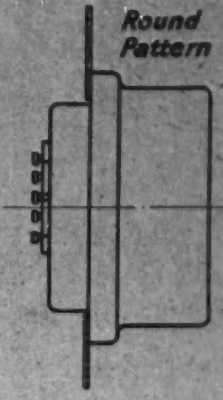

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ELECTRICAL TIMES

Volume 124 No. 3235 5 NOVEMBER, 1953

PUBLISHED EVERY THURSDAY

CORROSION PROTECTION OF CABLES, by E. P. G. Thornton, A.M.I.E.E. 843

RETROSPECT AND ADVICE 849

ELECTRONIC RELIABILITY 850

SANDWICH SYSTEM TO GO 852

INSULATION IN H.V. STATIONS, by S. E. Newman, A.C.G.I., A.M.I.E.E., and A. R. Parish, B.Sc.(Eng.), A.M.I.E.E. 853

PROBLEMS AND PRACTICE IN ENGINEERING ... 857

PLANT FOR PORTUGAL 858

U.K. PLANS FOR NUCLEAR POWER 862

THE DAIRY SHOW 863

OVERSEAS NEWS 864

PERSONALITIES IN THE INDUSTRY 866

NEW LITERATURE 868

HOOVER MARKET NEW STEAM IRON 869

TEN YEARS IN NORTH OF SCOTLAND 870

GAS SUPPLY IN 1952 870

THE BUYER'S COLUMN 871

THE WEEK IN NEWS 873

Questions in Parliament 878

Electric Supply News 880

Company Activities 880

COMMERCIAL INFORMATION 882

CLASSIFIED ADVERTISEMENTS 59

INDEX TO ADVERTISERS 66

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ESTABLISHED 1891

SUBSCRIPTION RATES—United Kingdom and Overseas £2 10s. 0d. per annum. Canada C$7·50c., U.S.A. $7·50c. per annum. Subscriptions are payable in advance and may commence with any issue throughout the year. Overseas subscriptions may be paid to The Electrical Times Limited by banker's draft, cheque or international money order. Single copies are obtainable, price 9d. each.

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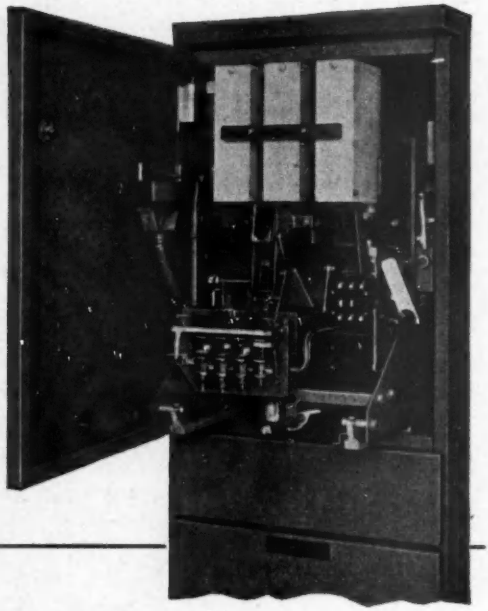

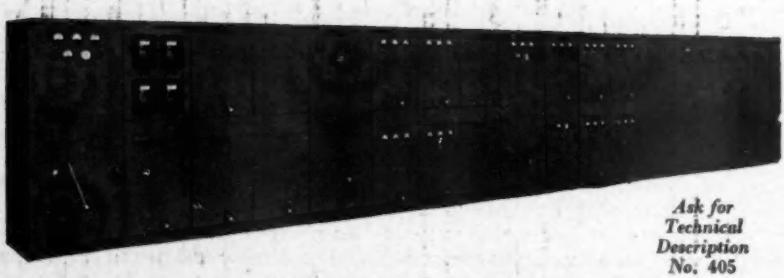

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THE GENERAL ELECTRIC CO. LTD., MAGNET HOUSE, KINGSWAY, LONDON, W.C.2

Editorial

NUCLEAR ACCELERATION

SIR CHRISTOPHER HINTON'S widely reported New York speech on the future of atomic energy in electricity generation added no startling facts to the pattern already mapped out. A start will be made with slow neutron reactors, with fast breeder reactors certain to come in the future, but at a considerably later date. The cost of nuclear based energy should be comparable with that from conventional steam stations, and should decrease as development proceeds. What is particularly encouraging, however, is the time scale that Sir Christopher put forward. His suggestion that within a few years the B.E.A. may be ordering nuclear reactors from the British power plant industry is the most optimistic estimate yet. From such a well-informed speaker, it is an exciting sign of things soon to come.

HOME AID FOR EXPORTS

LAST week saw renewed evidence that the leaders of British industry are unhappy about the outlook for exports. It is becoming apparent that 1953 will be a less successful year than had been hoped, and that the future is dark with uncertainty in this essential sector of our national activity. Increased competition from erstwhile enemy countries, the effects of American financing, and a genuine reduction in expenditure are all taking effect, and the feeling is deepening that Britain is losing ground in the developing situation. Complicating the whole problem is the provision by some Governments of disguised subsidies for their exporters—long-term loans, special taxation provisions and permission to retain and use part of the foreign currency that is earned, are some typical practices. It is significant that a representative committee of Western European business men have issued an agreed statement calling for a three-months' holiday from the introduction of further "artificial incentives": in the absence of such an interval they fear the development of a disastrous subsidy race that will prove expensive in internal taxation without offering any real home advantage. If, because of this, the British Government is to refrain from matching for her own industrialists the aid enjoyed by their foreign competitors, then the answer may lie, as Mr. Maxwell Buist, of B.E.A.M.A., pointed out, in the encouragement of home trade by relaxation of taxation. A healthy home market is the traditional basis for low-priced high-quality exports, and it merits development.

FINANCE FOR ENGINEERS

ACCOUNTANCY and company finance are usually uncongenial mysteries to the engineer, who finds them alien to his technical task of finding the best way of using available materials and resources in the performance of a defined operation. Yet the consideration of resources inevitably entails some attention to prices, and the evaluation of methods can seldom exclude consideration of running costs and of depreciation. There is much to be said for the engineer going forward from these relatively simple ideas to the more advanced viewpoint that embraces the effects of taxation and of company financial structure as well. This argument was advanced recently by Mr. J. R. W. Murland in his Chairman's Address to the I.E.E. Northern Ireland Centre, and it is one that deserves more attention from electrical engineers than it usually receives. The engineer inevitably finds himself from time to time stating a case for some improvement which he considers technically sound; he is more likely to convince the management officials he is addressing if he can show that he has paid some intelligent attention to the financial considerations which intimately affect their job as

profit-makers. More important still he is less likely to mislead them about possible savings, and so bring subsequent disappointment and ingrained suspicion of future proposals. On all counts, attention to the details of finance is a worth-while study for the engineer—and it has the valuable advantage of fitting him for management duties in the future.

RESTRICTIVE REGULATIONS

THE sandwich system of training, whereby the engineering student interposes separate years of works experience between full-time theoretical instruction has for long been the outstanding feature of Faraday House, that old-established independent college of electrical engineering. Many engineers now eminent in their profession received their training under its provisions at a time when practical experience by formal post-graduate apprenticeship was less easy to obtain than it is today. Now Faraday House is to abandon the sandwich system, not willingly, but largely as a result of the stiffened I.E.E. examination curriculum and membership regulations. Thus Faraday House is the first victim of the recent I.E.E. changes; it is unlikely to be the last. Doubtless this cost has been counted: but it was disconcerting to hear, on the same evening that this decision was announced, that modifications to existing requirements are under consideration by the Institution's practical training committee. Surely there should be no new tightening up of requirements until the full effects of the recent changes have become apparent. There is an increasing danger that by reducing the number of men who can qualify as professional engineers, industry will lose more than is likely to be gained by the improvement in quality expected of those who remain.

COOKER CHOICE

ONCE again this year, the Gas Council in its annual report is able to boast that the preference amongst occupants of new houses and flats is strongly for gas cooking. 83%; 71%; 86%, "even higher than that for last year" run the figures for the proportion of new tenants choosing gas for cooking in some areas. The figures make depressing reading for the electrical industry until it is remembered that two most important factors were operating during the period covered by the report. First, many of the families moving into the new dwellings which have been rising in record numbers, already owned a gas cooker. Effectively, they exercised no choice at all, merely extending a decision made years before, to change which would have entailed unwelcome expenditure. The second factor was publicity. Vigorous salesmanship is necessary to encourage the break with familiar gas, and this needs the backing of persuasive advertising and carefully prepared literature that will hammer home electricity's advantages. While the promotional ban existed this support operation could not be properly organised. The relative freedom that now exists should cause a change for the better in the figures that will be presented in the reports for 1953 to 1954—and another step towards cheaper power for everyone.

SMOKELESS TERMINI

SMOKELESS zones are prominent in the news today, with an increasing number of municipalities considering their establishment. Glasgow is amongst them, and in that city a new problem has arisen. What is to be done when a railway terminus is situated near the centre of the proposed zone? Even railway enthusiasts will not suggest that the coal-fired locomotive is a desirable adjunct to clean air, and it is difficult to conceive of any effective modification being made that will much ameliorate the nuisance caused. The same problem has been faced in North America, and has been dealt with somewhat drastically. Steam engines are excluded from the centres of cities, an electric lomotive taking over for the final stage of the journey to the main station. Such a step is unlikely to be favoured in Britain in the near future, but it is yet another indication of the revolution in practice which the smokeless zone movement may wreak.

Meteor

CORROSION PROTECTION OF CABLES

With particular reference to Gas-pressure and Oil-filled types

By E. P. G. THORNTON,* A.M.I.E.E.

THE rapid demand in recent years for the bulk transmission of power has resulted in an increased use of power cables operating at 33 kV and higher voltages. Figure 1 [1] shows how the service voltage throughout the world has increased during the past sixty years.

Present-day high metal prices (shown in Figure 2 [2]) have resulted in greater use being made, for these voltages, of gas-pressure and oil-filled cables, in view of the high dielectric stress and high current rating, and the economy consequent upon the use of such cables. Furthermore, a warning (audible or visual as required) is provided in the event of local damage or a weakness occurring in the metal sheath. This self-supervisory feature of gas-pressure and/or oil-filled cable systems, as compared with solid core type cables, is of particular importance to the cable user.

Reinforcement

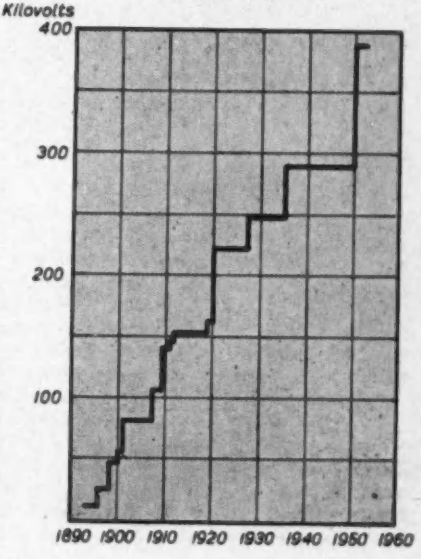
It should be appreciated, however, that lead or lead alloys [3] used for sheathing power cables exhibit the phenomenon of creep at low mechanical stresses. The fluid pressures under which gas-pressure and oil-filled cable systems operate, necessitate special mechanical reinforcement, continuously to support the lead sheath and take the load when the latter has expanded into close contact with the reinforcement. A tube under internal pressure is subject to two primary mechanical stresses; a hoop stress, and a longitudinal stress of half the hoop stress value. One design of reinforcement consists of metal tapes applied at the equilibrium angle of approximately 54°, so as to compensate for both the hoop and longitudinal stresses. This design of reinforcement (known as the compensated type) achieves the maximum economy in the use of the expensive reinforcing materials for any given factor of safety.

An alternative design of reinforcement [4] deals with the two stress components separately, by applying closely butting narrow metal tapes at an angle of approximately 20° to reinforce against the longitudinal stress, followed by one or more layers of metal tapes applied at an angle of approximately 85° to provide reinforcement against the hoop stress.

For both types of reinforcement for single-core cables, non-ferrous tapes must be used in order to reduce electrical losses in the reinforcement, while for 3-core cables, ferrous or non-ferrous tapes may be used. It should be noted, however, that ferrous tapes are the more susceptible to corrosion.

In all types of reinforcement, the dimensions and method of application are based on carefully calculated designs (the factor of safety is 2 on the basis of 0·01% proof stress) and, for economy reasons, high mechanical stresses in

Fig. 1. Shows the maximum transmission voltage in use or about to be used



* Mr. Thornton is with Messrs. W. T. Glover & Co. Ltd.

these reinforcing tapes must be used. It is clear that for reinforced gas-pressure and oil-filled cables the use of these high mechanical stresses results in relatively small wall thicknesses of reinforcement which do not permit of any substantial margin for corrosion effects; such cables require therefore a higher standard of protection against corrosion than has been necessary hitherto. Until about 1943 lead sheaths were used over the reinforcement to protect it from corrosion, but with the increasing cost of lead (see Figure 2), this method was abandoned. In this connection it should be noted that when the outer lead sheath was used it was satisfactory to employ brass tape reinforcement. When, however, the lead sheath was replaced by anti-corrosion coverings containing organic materials, such as rubber or p.v.c. which are not absolutely impermeable, brass could no longer safely be used owing to the danger of season-cracking.

The introduction of aluminium sheathing for all types of cables, though on a limited scale, has further emphasised the need for a special anti-corrosion protection. Aluminium is particularly susceptible to corrosion in alkaline soils and further, owing to its position in the electro-chemical series the danger of corrosion due to contact with dissimilar metals must be considerable.

It will be seen that advances in basic power cable designs, particularly at the higher voltages, are becoming more and more dependent for their successful application, on the efficacy of the protection employed against corrosion. It is probable that in many cases service life is already limited by resistance to corrosion, and the object of this article is to review briefly, but critically, present-day practice and developments on corrosion protection of cables in the light of the much greater importance which this feature of cable design has now assumed.

Standard Coverings

For the lower voltage range of power cables to B.S. 480, it is standard practice to use fibrous protection, suitably pre-impregnated and compounded, to resist the ingress of moisture. All the fibrous materials used for the bedding and serving of such cables are primarily carriers for the water-resistant compounds, and the best type of covering may be dependent to some extent on the type of compound used.

The following is a summary of the alternative protective servings used on cables to B.S. 480 (Paper-Insulated Cables for Electricity Supply), and for normal conditions of operation, experience has shown these coverings are generally satisfactory.

PROTECTIVE SERVINGS TO B.S. 480.

Unarmoured Cables

(P_2J)

(*a*) Coating of waterproof compound.
(*b*) One lapping of impregnated paper tape.
(*c*) One lapping of impregnated paper tape.
(*d*) Coating of waterproof compound.
(*e*) One lapping of jute rovings.
(*f*) Coating of waterproof compound.
(*g*) Lime wash.

(P_2H_2)

(*a*) Coating of waterproof compound.
(*b*) One lapping of impregnated paper tape.
(*c*) One lapping of impregnated paper tape.
(*d*) Coating of waterproof compound.
(*e*) One lapping of impregnated hessian tape.
(*f*) Coating of waterproof compound.
(*g*) One lapping of impregnated hessian tape.
(*h*) Coating of waterproof compound.
(*i*) Lime wash.

(P_2CH)

(*a*) Coating of waterproof compound.
(*b*) One lapping of impregnated paper tape.
(*c*) One lapping of impregnated paper tape.
(*d*) Coating of waterproof compound.
(*e*) One lapping of impregnated cotton tape.
(*f*) Coating of waterproof compound.
(*g*) One lapping of impregnated hessian tape.
(*h*) Coating of waterproof compound.
(*i*) Lime wash.

Steel Armoured Cables

(P_2JWH_2 or P_2JTH_2)

(*a*) Coating of waterproof compound.
(*b*) One lapping of impregntaed paper tape.
(*c*) One lapping of impregnated paper tape.
(*d*) Coating of waterproof compound.
(*e*) One lapping of impregnated jute strings.
(*f*) Coating of waterproof compound.
(*g*) One layer of armouring wires or two lappings of steel tape.
(*h*) Coating of waterproof compound.
(*i*) One lapping of impregnated hessian tape.
(*j*) Coating of waterproof compound.
(*k*) One lapping of impregnated hessian tape.
(*l*) Coating of waterproof compound.
(*m*) Lime wash.

($P_2H_2WH_2$ or $P_2H_2TH_2$)

(*a*) Coating of waterproof compound.
(*b*) One lapping of impregnated paper tape.
(*c*) One lapping of impregnated paper tape.
(*d*) Coating of waterproof compound.
(*e*) One lapping of impregnated hessian tape.
(*f*) Coating of waterproof compound.
(*g*) One lapping of impregnated hessian tape.
(*h*) Coating of waterproof compound.
(*i*) One layer of armouring wires or two lappings of steel tape.
(*j*) Coating of waterproof compound.
(*k*) One lapping of impregnated hessian tape.
(*l*) Coating of waterproof compound.
(*m*) One lapping of impregnated hessian tape.
(*n*) Coating of waterproof compound.
(*o*) Lime wash.

Special Coverings

The fibrous protective coverings specified in B.S. 480 for the low-voltage range of power cables are suitable for normal soil conditions, but where there is a risk of severe chemical and/or electrolytic corrosion, which often occurs adjacent to power stations, chemical works or in ground containing sewage (organic acids) or stray earth currents, special protective coverings are usually employed.

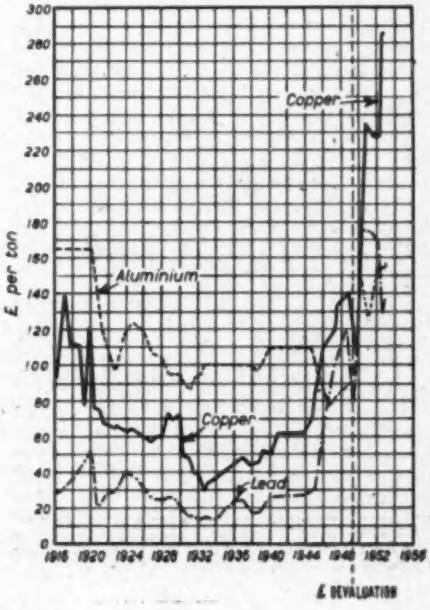
TABLE I. SPECIAL CORROSION PROTECTION COVERINGS.

Designation	Method of Application.	Observations.
Packer protection.	Two compounded paper tapes, cotton tape, hard rubber string spacers to give a radial spacing of 0·1 in., compound, cotton tape, 10 oz hessian tape.	Protection is dependent on the efficacy of the bitumen compound seal.
Rubber bitumen sandwich.	Cotton tape, rubber compound tapes, cotton tape, two impregnated 10 oz hessian tapes. (In some instances the order of application of the cotton tapes is altered.)	Protection is dependent on the efficacy of the bitumen compound seal.
P.V.C. plus glass fibres.	P.V.C. applied in tape form reinforced by a layer of bitumen saturated glass fibres also applied as a tape.	Protection is dependent on the efficacy of the bitumen compound seal.
Vulcanised rubber tapes.	Lapped around the cable, bonded and vulcanised.	Protection obtained by virtue of the impermeable rubber layer.
P.V.C. plus rubber tape.	Layers of p.v.c. tape and rubber tape wrapped round the cable.	Protection ensured by impermeable rubber layer. Migration of plasticiser from the p.v.c. over a period of time is a potential source of trouble.

For special protection under these corrosive conditions typical types of coverings which have been used are given in Table I.

The essential constituent of these special anti-corrosion servings is the introduction of a layer of an impermeable material such as rubber or p.v.c., and it is desirable that this impermeable layer should be in the form of a continuous tube surrounding the metallic reinforcement. The extrusion of a layer of rubber or p.v.c., due to limitations of existing plant, presents practical difficulties for large diameter power cables.

It is therefore reasonable with present-day factory equipment to manufacture this impermeable layer by lapping on the material in tape form and sealing off the overlaps of the tape, either by means of bitumen compound or, where possible, by bonding and vulcanising the overlapped tapes together, to form in effect a continuous tube. Where p.v.c. tapes are used as the impermeable medium, the overlaps can be sealed only by the use of bitumen compounds, but where rubber tapes are used as the impermeable medium, by means of a special compounding technique, the overlapped layers can be bonded together and subsequently vulcanised, assisted by the application of only a small amount of heat, to form a homogeneous sheath or tube.



The graph on the left shows the variation in the average price of the principal raw materials used in cable manufacture over the period 1916 to 1952. These are copper, soft lead (ingots) and aluminium. Note particularly the increase caused by the devaluation of the £.

Cost of Finish

It is essential to realise that for an internal pressure cable, the service life of the installation is wholly dependent on the efficacy of the protective media applied directly over the metallic reinforcing tapes. Furthermore, in the case of these cables, which are expensive in first cost and which are normally employed on circuits of vital importance, where continuity of supply is a primary consideration, the slightly more expensive special finishes become essential in order to avoid the need for remedial work during the life of the cable.

Even, however, if soils are free from contamination at the time of installation, such a finish is preferable, since effluence from subsequently sited factories may radically change soil conditions. Table No. 2 shows by way of example the relatively *small* extra cost involved by using a superior anti-corrosion protection on the range of insulated cables referred to.

TABLE II. APPROXIMATE PRICE INCREASE FOR ANTI-CORROSION PROTECTION

Load MVA.	Service voltage. kV	Conductor size. in.²	Approximate cost per mile including installation (P_2RP_2CH finish).	Approximate extra cost for special covering $CRCH_2$	Approximate percentage increase in total cost for special covering.
105	132	0·35 (single-core)	£31,610	£740	2·3
45	66	0·25 (single-core)	£23,100	£680	2·9
20	33	0·20 (3-core)	£14,120	£315	2·2

Laboratory Tests for Coverings

It is clearly not practicable to rely on service performance as the sole means of assessing the effectiveness of different corrosion protective coverings because the progress in developing improvements would be so slow. It has been necessary, therefore, to employ accelerated corrosion tests which can be applied in the laboratory for the purpose of evaluating the *relative* performances of different types of anti-corrosion coverings under service conditions. It must be emphasised that the results of such tests, in common with other accelerated laboratory tests applied to cables (e.g., oxygen-bomb test for rubber cables), must be treated with some reserve because of the difficulty of reproducing and accelerating the many variable factors which may occur during the long service life of a cable. Nevertheless, accelerated laboratory corrosion tests must be regarded as indispensable to the scientific development of improved anti-corrosion coverings.

An accelerated corrosion test which is widely used in laboratories is as follows: Before applying the test the lead-covered* cable shall be subjected to the bending test in Clause 17 of B.S. 480: 1942, except that the diameter of the barrel shall be twenty times the external diameter of the finished cable. The test length shall be erected vertically in a tank containing a solution of sodium chloride (0·5% concentration) with the cable resting on the base of the tank. The depth of the solution shall be maintained at a specified height above the base of the tank.

A steady potential of 10 V d.c. shall be applied between the electrolyte and the sheath, armour or reinforcement as the case may be, the latter being connected to the negative side of the supply. The initial leakage current shall be measured while the sample is cold and after 24 hours immersion in the solution. The sample shall then be subjected to a number of heat cycles by heating the electrolyte to a temperature of 65° C. This temperature shall be maintained for five hours and afterwards the electrolyte shall be allowed to cool naturally. A total of ten heat cycles shall be applied to the sample.

During the whole of the test period the leakage current at the cold temperature shall not be increased by more than 0·100 milliamps† above the initial measured value which itself shall not exceed the theoretical value determined by calculation, taking into account the specific resistance of the impermeable layer.

Critical Observations on Type Test

Gas-pressure and oil-filled cables of 33 kV and higher voltage are today permitted a maximum conductor temperature of 85° C. This means, in the case of a 33 kV oil-filled or gas-pressure cable, the temperature of the lead sheath and metallic reinforcement when the cable is fully loaded for a long period will be of the order of 70-75° C. Service experience in the past with these cables is not adequate proof of future satisfactory performance because it has been customary in this country to load cables on the basis of maximum conductor temperature, irrespective of the nature of the load cycle experienced in service. For economic reasons the present tendency is to take full advantage of the daily load cycle with the result that the temperature limit actually experienced in service, will for longer periods than hitherto, attain the maximum specified value. This imposes an increased duty from the temperature aspect, on the cable coverings. It is, therefore, logical that any laboratory test should ensure that the electrolyte temperature will be at least equal to the maximum sheath temperature attained in service, i.e., a more realistic temperature of the electrolyte during the heating cycle is 75° C.

It also follows that a test of only ten heating cycles is inadequate to simulate fully the most onerous service conditions. A realistic type test for anti-corrosion coverings (to prove the design) should be a minimum of 100 heat cycles —the test of ten heat cycles only represents a sample test to check uniformity of production [3].

* If this test is applied to aluminium sheathed cables, then the appropriate bending test applicable to such cables must be used. This test will be detailed in the forthcoming revision of B.S.480 specification.

† This arbitrary figure appears high, but at the present time there is insufficient test data to recommend a lower figure.

While every care is taken during installation to remove flints and stones from the soil immediately around the cable, nevertheless due to accidents or ground vibration, contact with flints or stones cannot always be avoided, and, therefore, a relatively tough covering is desirable. The effect of these stones may be simulated in a laboratory test by resting the "U" shaped test sample on stones or bricks in the electrolyte, and the type test referred to above could usefully be amplified in this respect.

Modified Laboratory Tests

In view of the critical observations recorded in the above, it was decided to modify the standard laboratory test to include for the effects of higher temperatures on coverings, extended time, and, by resting the cable samples on two bricks, simulate the effect of stones or flints which might foul the cable during or subsequent to installation. The modified test was similar to the standard test quoted previously, except for the following :—(*a*) the electrolyte temperature during the heat cycle was 75° C, (*b*) the duration of the test was approximately a thousand heat cycles and (*c*) the cable sample in the electrolyte tank was rested on two sharp edged bricks.

Samples of cable having an anti-corrosion serving incorporating vulcanised rubber tapes, and also samples of cable having an anti-corrosion serving incorporating p.v.c. and glass fibre tapes, were subjected to this more onerous laboratory test. A microammeter was connected in the circuit so that leakage currents as low as 0·5 microamps could be read.

Samples Examined

A description of samples subjected to modified laboratory test is given in the following section.

Sample "A"—0·040 in. minimum thickness of vulcanised rubber.

Lead covered cable with the following finish: Two special rubber compound tapes applied 50% overlap. (Note.—The two rubber tapes were of such a gauge as to give a total thickness of 0·040 in. minimum.) One cotton tape, bituminised and compounded, applied with 10/15% overlap. One 10 oz. hessian tape, bituminised, and compounded, applied with 25% overlap.

Sample "B"—0·020 minimum thickness of vulcanised rubber.

Lead covered cable with the following finish: One rubber tape, applied with 60% overlap. (Note.—The rubber tape was of such a thickness as to give a total thickness of 0·020 in. minimum.) One cotton tape, bituminised and compounded, applied with 10/15% overlap. One 10 oz. hessian tape, bituminised and compounded, applied with 25% overlap.

Sample "C_1"—P.V.C. and Fibreglass lapped compound sealed.

Lead covered cable with the following finish: One 0·006 in. thick p.v.c. tape applied with 50% overlap and bitumen compounded. Two x 0·010 in. thick fibreglass tapes applied butting and bitumen compounded. One x 10 oz. hessian, bituminised, applied with 25% overlap and bitumen compounded.

Sample "C_2"—P.V.C. and Fibreglass lapped compound sealed.

(Exactly as "C_1" above.)

Sample "C_3"—P.V.C. and Fibreglass lapped compound sealed.

Exactly as samples "C_1" and "C_2" above but of separate manufacture.

Table No. 3 shows the test results for the five samples of cable having special anti-corrosion servings. It should be noted that for

TABLE III. TEST RESULTS FOR THE FIVE SAMPLES

Sample No.	Heat cycles. No. heat cycles.	Heat cycles. Max. Temp. °C.	Heat cycles. Time Sample at max. temp. Hrs.	Saline Concentration. (NaCl)	Remarks.
"A" (with 40 mil special rubber layer).	345	65	2	0·5%	No measurable leakage current (less than 0·5μA). TEST CONTINUING.
	213	75	2	0·5%	
	164	65	5	0·5%	
	93	75	5	0·5%	
	173	75	5	3·0%	
"B" (with 20 mil special rubber layer).	248	65	2	0·5%	No measurable leakage current (less than 0·5μA). TEST CONTINUING.
	213	75	2	0·5%	
	164	65	5	0·5%	
	93	75	5	0·5%	
	173	75	5	3·0%	
"C_1" (P.V.C./ glass tape).	20	65	2	0·5%	Failure occurred after the 20th heat cycles where the sample rested against a brick.
"C_2" (P.V.C./ glass tape).	20	65	2	0·5%	Failure occurred after the 20th heat cycle, where due to manufacturing defect the overlap of the p.v.c. had been pushed back.
"C_3" (P.V.C./ glass tape).	100	65	5	0·5%	Failure occurred after 100th heat cycle due to cracked and embrittled p.v.c.

the test on sample "C_3", the sample was tied in the "as bent" position and suspended in the tank so that it was clear of the bricks and the bottom of the tank.

Review of Test Results

The particular vulcanised rubber compound used was similar in physical characteristics to that normally employed for tough rubber sheaths (*i.e.*, relatively high carbon black content), and was such as to give qualities of elasticity and high abrasion resistance. Although satisfactory test results were obtained on 0·020 and 0·040 in. thick vulcanised rubber layers, nevertheless in view of limited service experience, it is considered that the 0·020 in. layer should be used only where near neutral soil conditions exist and where mechanical handling of the cable during installation is limited. Wherever the 0·020 in. thickness of rubber is used, great care should be taken to see that a minimum overlap of 50% is obtained. In one sample similar to sample "B" above, the overlap at one position was reduced to 45%. Failure occurred at this single thickness position after 232 heat cycles. Where considerable mechanical handling and/or excessive corrosion conditions exist, it will be sound engineering practice to use the 0·040 in. thick rubber layer which inherently provides a higher factor of safety at a relatively small increased cost in relation to the overall economics of the scheme.

The limited test results recorded on the p.v.c./Fibreglass coverings do not show the same long term freedom from ingress of moisture. It is considered that the following are the main shortcomings of this type of finish. (1) The finish relies on a bitumen compound seal as a barrier against moisture penetration, and the test results indicate that this barrier is not sufficiently effective. (2) The p.v.c. material, due to loss of plasticiser, becomes severely embrittled and mechanically weak.

The test results given are limited to one grade of p.v.c., and it would be desirable to ensure that if p.v.c. is incorporated in the special coverings detailed, it does not contain volatile plasticisers which will result over a period of time in embrittlement of the p.v.c. layer. This means that any p.v.c. coverings examined in this connection must show satisfactory test results (at the maximum temperatures obtaining in service) extended over a long period.

Possible Future Trends

At the present time lapped rubber or p.v.c. tapes are mainly employed, but it is obvious that a greater use of the extrusion of such materials provides the logical means of obtaining a truly homogeneous covering [6] [7]. Such a technique is desirable, but close manufacturing tolerances and freedom from eccentricity is necessary if a thin-wall rubber or thermoplastic sheath is to be extruded on to large diameter power cables. Consideration must also be given to the suitability of thermoplastic materials in general, having regard to the inherent susceptibility of such materials to deformation resulting from cold flow.

For certain applications synthetic rubber coverings may have more desirable physical and mechanical properties than natural rubber. In this connection the development of a satisfactory synthetic rubber compound capable of being vulcanised without damage to the cable would be a progressive step.

Semi-conducting rubber compounds [8] have also been suggested because it can be argued that such a compound would distribute over a large area any electro-chemical attack. It is considered however, that such an approach deserves only secondary consideration, since primary development in this field should be devoted to the search for materials and application techniques, which provide an impermeable covering of high specific resistance and electrical stability.

There is some evidence from work that is being carried out that under certain conditions of high temperature and humidity (not normally applicable to the United Kingdom), that corrosion protective coverings may have been deteriorated by micro-organism attack (Spicaria violacea Abbott). In such cases any cellulose components (cotton, paper, jute) may be attacked and organic acids (e.g., acetic acid) released. The information is as yet inconclusive and more work is required on this aspect of corrosion.

Electrical Tests on Servings

Since the efficacy of all these anti-corrosion servings depends upon the soundness of the impermeable layer of rubber or p.v.c., it is desirable to carry out some tests at the manufacturers works, to prove that this membrane is undamaged i.e. is free from holes, tears or other mechanical damage. Since it would not be practicable or desirable to immerse the completed cable in water, a suitable insulation resistance test of the whole serving may be carried out by coating the outer layer of fabric with a graphite finish in place of the usual whitewash. The limits of values of insulation resistance for a given type of finish would have to be established by experience, but it is con-

sidered that severe manufacturing defects would be revealed by such a test.

A further insulation resistance test should be carried out immediately after installation of the cable, and by comparison with the insulation resistance values obtained in the factory, any damage caused during installation could be found. The existence of a graphite finish facilitates this second test and also provides great assistance in the localisation of any defect. As further evidence of the behaviour in service of these special anti-corrosive servings, insulation resistance tests of the whole serving may be taken at intervals during the life of the cable, thus providing information at an early stage of any deterioration.

The foregoing notes provide only a brief review of the present-day position and the absence of clear cut factual data in the form of laboratory tests correlated with service experience, indicates the pressing need for close manufacturer and user co-operation.

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RETROSPECT AND ADVICE

FOR his address to the Northern Ireland Centre of the Institution of Electrical Engineers, Mr. J. R. W. Murland chose to discuss some economic aspects of industrial electrification. His approach was, that the circumstances in which engineering projects are undertaken places upon engineers the duty of presenting their proposals in economic terms and in language comprehensible to men with little, if any, engineering knowledge.

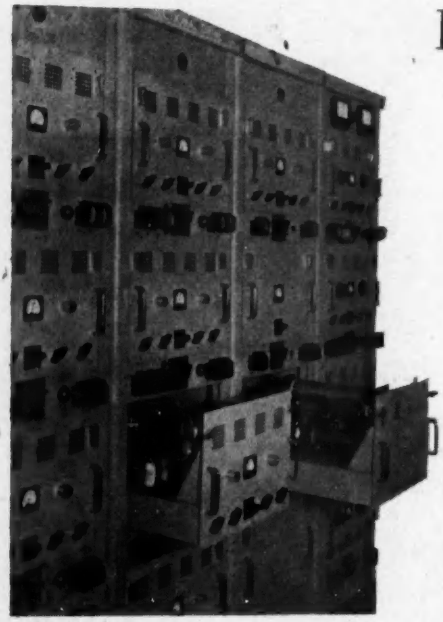
As an example, Mr. Murland considered a statement such as "here is a piece of equipment which will cost £1,000; it will cost £200 less to run than what you have at present. Obviously it will pay for itself in 5 years." Accurate on an engineer's desk, such a statement may be misleading at a directors' meeting, for reasons connected with taxation laws and the financial details of the purchasing company's affairs. The engineer needs to know more of these matters than he usually does. At the least, he must appreciate the economic possibilities inherent in his proposals, even if he is not in a position to evaluate them.

For instance, in the case quoted, the more precise statement might have been "cost £1,000; £200 less a year to run. At present taxation rates you will recover its cost over its actual useful life, and there will be a cash saving of £105 per annum (after paying tax) while the equipment is in operation." This is not quite the same as saying it will pay for itself in five years! Although the engineer is primarily and properly concerned with technical matters, he should always be conscious of the effect and influence of the economic background.

After this concern with accountancy problems, Mr. Murland went on to talk about technical problems which strongly influence, or are influenced by the economic background. He discussed, for instance, the estimation of running costs, and the choice of motors, cables and control gear. From his arguments he drew another basic lesson for engineers to learn. They have to realise how extremely hard it is to tell the truth, even with the best will in the world. Put in another way, they must continually appreciate the inevitable and inherent inaccuracies in the estimates they submit. Their task is not to lament the absence of absolute truth, but to remain fully aware of what is actually being done. In particular, any estimate should contain an evaluation of its probable margin of error. In practice this may take the form of a detailed explanation of the reasons for making the estimate in a particular way.

Western Centre History

A very different approach was adopted by Mr. J. Vaughan Harries for his address to the Western Centre. He reviewed the history of the Centre, and the Addresses delivered by some of its earlier chairmen; and he did so in the style he has made his own. Unfortunately, such addresses are better heard than read. This one does, however, whet the appetite for the history of the Centre that was once mooted.



Electronic Reliability

PAPER MACHINE DRIVE INCORPORATES VALVE AMPLIFIERS FOR SPEED AND TENSION CONTROL

PAPER-MAKING machinery must be reliable. Any stoppage in a run can prove very expensive, and special care must be taken to avoid such an occurrence. This adds interest to the use of electronic equipment to provide the close control of speed necessary in paper-making machinery, for many engineers still regard valves as rather uncertain components, not to be trusted where important drives are concerned.

Paper Mill Control

A recent example of an installation fully dependent on electronic equipment is that brought into operation by The Guard Bridge Paper Co., whose mill is situated near St. Andrews in Scotland. The machine concerned was supplied by James Bertram and Co. and is designed to produce fine quality writing papers. It consists essentially of a large number of rollers, over and through which the paper is led, and from the drive point of view, each of these rollers must run at a carefully controlled speed which varies from stage to stage of the 17-section machine. Driving motors and electronic and electromagnetic control gear have been supplied by the British Thomson-Houston Co. Ltd.

Fig. 1, at the top of the page, gives a close-up view of the electronic control cubicle, with two of the self-contained trays partially withdrawn

Each section of the machine is driven by a forced-ventilated geared motor, shunt wound and with a fixed field. Speed control is obtained over a 10:1 range by means of armature voltage control, a separate generator being provided for each motor. The generators are grouped into three motor-generator sets each having a 125 h.p. driving motor.

Control Circuit

Fig. 3 shows the control adopted for each section drive. The d.c. constant excitation motor (1) takes its armature current from a Ward-Leonard generator (2), which is excited by a grid-controlled thyratron device. The motor (1) has coupled to it a small tacho-meter generator (4), whose output is a voltage proportional to motor speed. This is compared with a reference voltage (obtained from busbar 3), and any difference is amplified (in amplifier 5) and applied to control the firing of the generator field thyratrons.

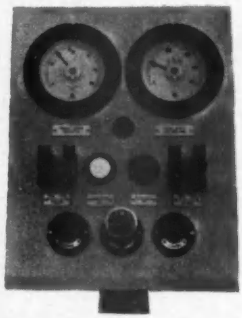


Fig. 2. In this view of the master control pedestal the feet per minute and preset indicators are seen at the top

Busbar 3 provides a common link throughout the paper-making machine, so that to

alter the speed of the machine as a whole, it is only necessary to adjust a master rheostat (7). Each section control has a small draw rheostat (8) which permits variation of the speed of that section relative to other parts of the machine. A crawl busbar (9) provides a low voltage reference for inching and crawling requirements. This voltage is preset by the rheostat below the master rheostat (7).

Stable d.c. and a.c. supplies are provided by an exciter (10) and an alternator (11). Electronic regulators (12 and 13) ensure that the output of these machines is constant within ±0·2%. The two machines are driven by a 46 h.p. motor, with which they make up a fourth motor-generator set. Starting of each section is controlled by a rheostat (14) which permits smooth transfer of the reference voltage from crawling to running level.

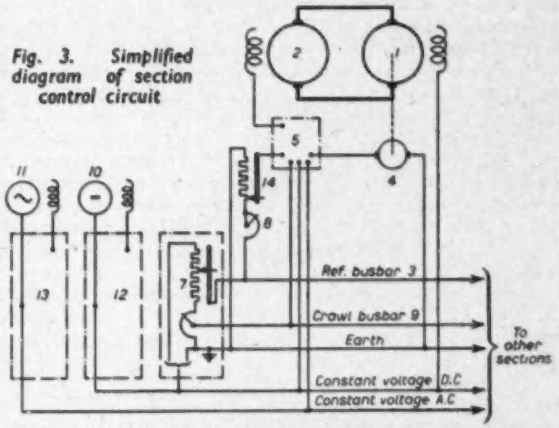


Fig. 3. Simplified diagram of section control circuit

Each section is controlled from a small water-tight box which has an inch push-button, a "crawl-off-run" switch, and a hand-wheel for adjusting the draw rheostat (8). Overall control is exercised from a master pedestal (Fig. 2) incorporating "raise" and "lower" speed buttons, an emergency stop, a feet-per minute indicator, and a dial indicating the final speed for which the machine is preset at any instant.

Each section is provided with a relatively simple contactor assembly, comprising line contactor, line isolator, field switch, inching relay, and appropriate protective relays. These switches, etc., are panel mounted alongside the electronic control equipment.

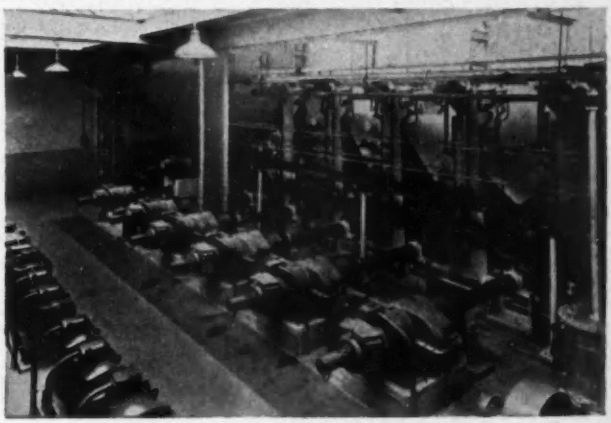
Electronic Equipment

This electronic equipment, to which reference has already been made, is housed in six sheet-steel cubicles. Both speed and voltage regulators are accommodated in sliding trays provided with plug and socket connections. Spare trays are provided in each cubicle, and in the event of a fault, replacement of any tray is a rapid and simple procedure. The trays are provided with grills as can be seen in the illustration and this allows thyratron failure to be readily detected, since the glow discharge of a healthy valve is made visible. Two thyratrons connected in parallel are provided in each arm of the field current rectifier, so that the failure of any one of a pair does not interfere with operation of the machine.

Valves in general are run at a fraction of the maker's ratings, usually one-half. By this means life expectancy of 30,000 hours can be obtained. The device of paralleling valves is not confined to the thyratrons, but is adopted wherever possible. Another set of vital components, the tachometer generators, are of a special design, using a permanent magnet field, monel metal commutator, and pairs of silver-graphite brushes.

Reference has not yet been made to the

Fig. 4. Forced-ventilated, geared-motor units at the mill's dry-end



reel control. The reel requires a drive which progressively reduces speed as the reel builds up in diameter, and which will increase motor torque so that constant tension is maintained in the paper.

These characteristics are obtained most readily by means of a d.c. shunt motor. The required change of speed with reel build-up is effected by shunt field control and the armature voltage is varied in proportion to paper speed, so that constant tension is obtained by keeping the armature current constant.

The reel equipment comprises a six-phase half-wave rectifier supplying the armature power, and a single phase full-wave rectifier for providing the shunt field excitation. Armature voltage is regulated by comparison with the master speed reference voltage in a two-stage electronic amplifier. The shunt field current is controlled by the difference between a voltage proportional to armature current and a stabilised reference voltage.

Two identical reel equipments are provided to permit continuous operation of the machine. On the reel control stations, an ammeter is provided which gives a measure of the tension in the paper.

Experience with this drive, which has 17 motors of from 7·5 up to 30 h.p. under the control of electronic devices, confirms again that electronic equipment, if suitably designed, is fully satisfactory for use in arduous industrial conditions.

Sandwich System to Go

OLD Faradians attending last Thursday's annual dinner of their Association heard that the Sandwich system which has for so long distinguished the training offered at Faraday House, is to be abandoned. The announcement was made by Dr. W. R. C. Coode-Adams, the Principal, in his reply to the toast "Faraday House."

Fewer Technologists

Among the reasons that have led to this alteration is the change in the I.E.E. curriculum and the requirement for a two-year apprenticeship. As a result of the raising of standards which was involved it seemed likely, Dr. Coode-Adams said, that fewer candidates would pass their examinations, and as a result, there would be a still greater shortage of qualified technologists. This seemed strange in some ways when such eminent educationalists as Sir Richard Southwell were saying that the universities would have to lower their standard of entry. It raised the question, where do we go from here?

As is traditional, the toast of Faraday House had been proposed by the President of the I.E.E., this year Mr. H. Bishop. He recalled that the motto of the college, "Theory and Practice," exemplified the sandwich system, in the application of which the college was the pioneer. Today, however, it seemed fair to say that the question was ripe for discussion, whether the sandwich course was sufficient for present needs. The modification of its courses would fit in with the Institution's ideas for two years of practical experience. Incidentally, this had been recommended in the 1947 report of the practical training committee of the I.E.E., and this same committee was now reconsidering its views, which might be modified.

On the subject of higher technological education generally, Mr. Bishop thought that we should not follow the example of other countries too closely. There was much to learn from them, but we should not allow ourselves to be forced into unnatural courses of training, just because they were adopted in the U.S.A. Moreover, all engineers should help in recruiting for their profession: the right men in the right numbers were urgently required. Headmasters at school had little idea of what the profession offered.

Test Gear needed

The other principal speaker was Air Chief Marshal Sir John Whitworth Jones, who commented on the absolute dependence of H.M. fighting forces on electrical engineering. He called for still more inventiveness, but had two special pleas. First that equipment should be designed so that it could be maintained by semi-skilled men under field conditions; and secondly that appropriate test gear should be designed at the same time as the equipment itself.

A record number of members and guests attended the dinner, which was held under the genial chairmanship of Mr. A. N. Irens. Mr. D. E. Bird, the immediate Past President of the Faraday Host O.S.A., proposed the toast "The Guests," and Mr. K. B. Blake that of "The Chairman."

Insulation in H.V. Stations

CONSIDERATIONS AFFECTING CHOICE OF INSULATION LEVELS AND TESTING REQUIREMENTS

By S. E. NEWMAN, A.C.G.I., A.M.I.E.E. and A. R. PARISH, B.Sc. (Eng.), A.M.I.E.E.*

UNTIL comparatively recent years the design of equipment and installations subject to lightning had to be based on performance under power frequency (normally 50 cycle) high voltage tests, although in fact system frequency overvoltages of the magnitude used for testing could not possibly occur in service. The knowledge gained of the nature and behaviour of lightning, however, has led to the introduction of impulse voltage testing of high voltage equipment and to insulation co-ordination being based primarily on impulse performance. This change of outlook is reflected in the inclusion of impulse tests for outdoor high voltage circuit-breakers in the 1952 issue of B.S.116 "Oil Circuit-Breakers." An impulse generator capable of producing 3,200 kV and used for testing switchgear and transformers is shown in Fig. 1.

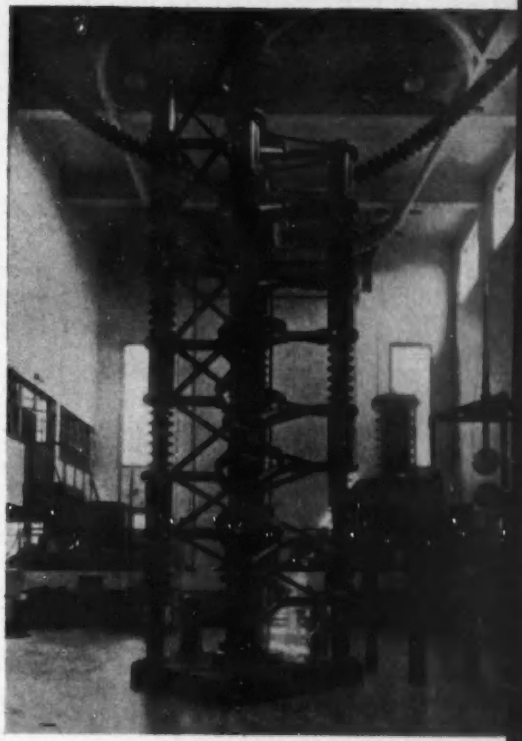


Fig. 1. Marx type impulse generator as used for insulation testing in a manufacturer's laboratories

Impulse Testing

The magnitude and wave shapes of lightning strokes vary greatly and it has therefore been necessary to lay down the standards of wave shape for impulse testing. An impulse is defined as "an artificially produced unidirectional transient of controlled wave shape and amplitude" and the British standard impulse voltage wave is one having a front of 1 microsecond and a time to half-value of wave tail of 50 microseconds, as shown in Fig. 2. This is normally referred to as a 1/50 full wave and its voltage is specified by the maximum amplitude, or peak value. The impulse may be either of positive or negative polarity. It may be of interest to note that the American standard wave is a 1½/40 wave, but in most practical cases test results are very little affected by the slight differences between the two standard shapes. The tolerances on the time to crest and to half value permitted by B.S. 923-1940 "Impulse Voltage Testing" are such that a 1½/40 wave just lies within the B.S. tolerance limits of a 1/50 wave.

For most apparatus it is necessary to know the "impulse withstand" value since this is the maximum voltage at which break-down of insulation does not occur under impulse test but for some apparatus the "50% impulse flashover voltage" is mentioned and this is defined as the peak value of the impulse voltage which causes flashover of the object under test for about half the number of applied impulses.

When the object under test flashes over it "chops" the impulse wave; this chopping may be on the wave front as shown in

* Messrs. Newman and Parish are with the English Electric Co., Ltd.

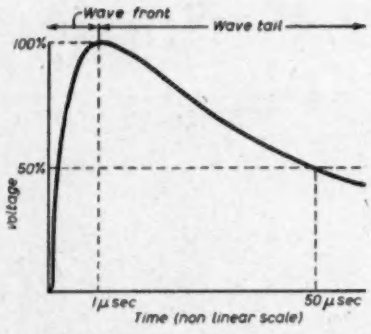


Fig. 2. Waveform of a 1/50 microsecond pulse

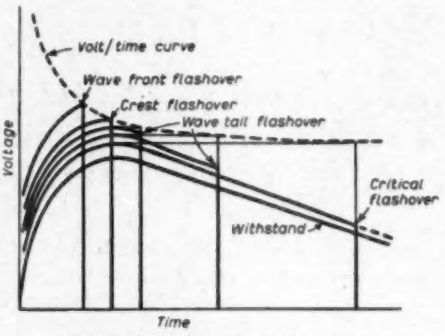


Fig. 5. Formation of volt/time curve

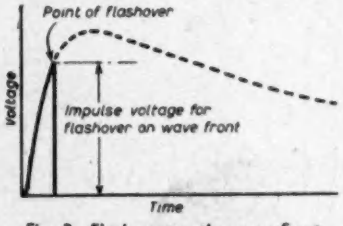


Fig. 3. Flashover on the wave-front

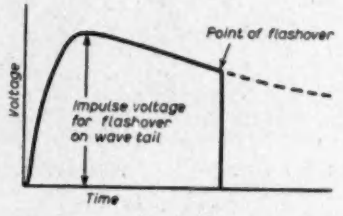


Fig. 4 (above). Flashover on the wave-tail, and Fig. 6 (below). Impulse breakdown characteristics of 30-in. rod gap

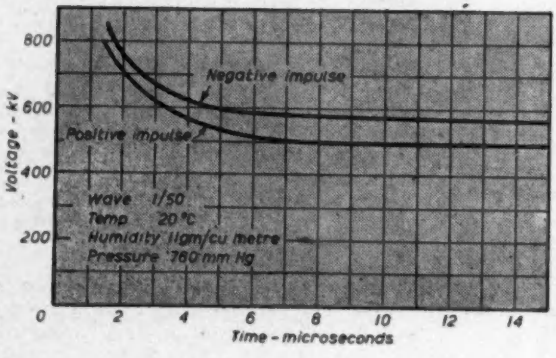


Fig. (3) or on the tail as in Fig. (4). For flashovers on the wave front the flashover voltage is defined as the voltage at the point of flashover. For wave tail flashovers the flashover voltage is the peak value of the impulse wave causing flashover.

Standard impulse voltage levels have been laid down in B.S. 116:1952 for outdoor type oil circuit-breakers. These are "withstand" values, and are given in the following table:—

TABLE I. STANDARD IMPULSE VOLTAGE LEVELS

Rated Service Voltage	Impulse Withstand Test Voltage	
	Non-effectively earthed systems	Effectively earthed systems
22	150	150
33	190	190
44	260	260
66	330	330
88	450	450
110	550	450
132	630	550
165	730	630
220	1,050	890
275	—	1,050

These impulse insulation levels are generally applicable to transformers as well as switchgear. They are similar to the impulse levels which are proposed by the International Electrotechnical Commission for an international standard and when this standard is issued the values in B.S.116, if different, will be brought into conformity. In addition they compare closely with American standard basic insulation levels (BIL's) and as determined by practical experience of protection levels afforded by available surge diverters.

Air-Gap Volt/Time Curves

If an impulse voltage slightly in excess of the maximum withstand value is applied to an air gap, sparkover will occur on the wave tail. With increasing voltage sparkover will occur correspondingly earlier until the crest flashover value is reached (i.e. sparkover takes place on the crest of the impulse wave), and if the voltage is still further increased sparkover will occur on the wave front. If these sparkover voltages are plotted against time a volt-time curve is obtained as shown in Fig. 5.

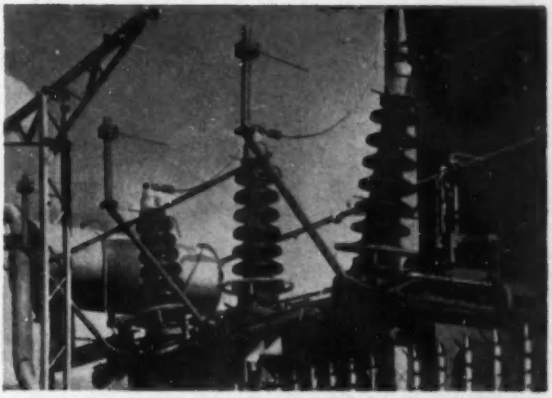


Fig. 7. Co-ordinating gaps mounted on a typical transformer

Typical volt-time curves for a rod gap are shown in Fig. 6. As would be expected the gap has a higher flashover voltage on negative impulses. This disparity between the positive and negative flashover values is influenced by proximity to earth or to a conductor carrying current, e.g. a bushing.

A typical co-ordinating gap for the protection of a transformer is shown in Fig. 7; rod electrodes are used, as, although spheres have a shorter time lag, their performance is adversely affected by any burning from the power arc which follows a sparkover and by climatic conditions.

Impulse Characteristics

Typical positive and negative impulse curves for a multi-unit post insulator are shown in Fig. 8. As would be expected the curves are generally similar in form to those of a rod gap.

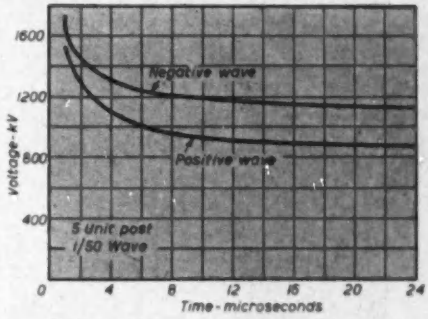


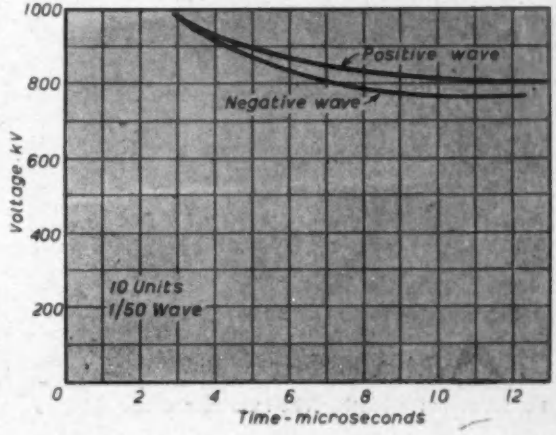
Fig. 8 (above). Impulse breakdown characteristics of post type insulators

Fig. 9 (below). Impulse breakdown characteristics of suspension type insulators

Similar curves for a multi-unit insulator string are shown in Fig. 9. It will be noted that the addition of the arcing fittings and consequent change in configuration of the electric field has, in this case, resulted in a change in the relative positions of the positive and negative volt-time curves.

Transformer Impulse Characteristics

In addition to the previous items which concern flashover in air, the impulse characteristics of transformers are important. The insulating materials used in high voltage transformers are



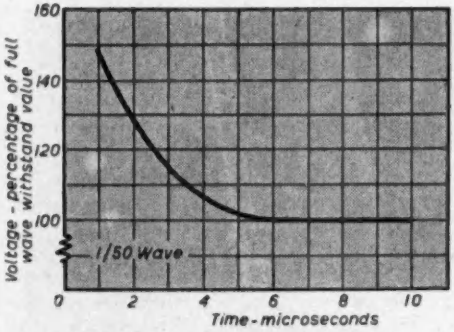


Fig. 10. Impulse withstand characteristics of transformer major insulation

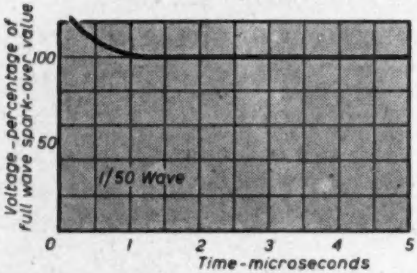


Fig. 11. Impulse breakdown characteristics of surge diverter spark gaps

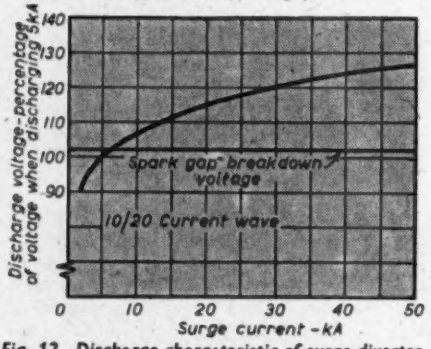


Fig. 12. Discharge characteristic of surge diverter

oil and paper and a typical withstand volt-time curve of transformer major insulation is shown in Fig. 10. It will be seen that it differs from previous curves in showing a voltage which is less affected by time, being substantially flat after 5 micro-seconds.

In connection with the impulse characteristics of transformers it should be borne in mind that impulse voltages stress the inter-turn insulation of the transformer as well as the insulation to earth. The inter-turn stress depends on the steepness of the wave front of the impulse and may be aggravated by oscillations occurring within the transformer winding. The protection of the inter-turn insulation is, however, primarily a matter for the transformer designer rather than for the system engineer and a number of ingenious designs of winding have been evolved. One such design is described by Chadwick, Ferguson, Ryder and Stearn.*

Protective Devices

The protective devices which are available for the protection of apparatus against surges are rod gaps, expulsion gaps and surge diverters. Rod gaps are the simplest and cheapest protective device but when they spark over to discharge a surge, power "follow" current usually flows along the ionised path produced by the spark over and thus an earth fault is placed on the system. Over a limited range of fault current the expulsion gap avoids this disadvantage of the plain rod gap by using the follow current to provide a blow out force.

Both rod and expulsion gaps have the same impulse characteristics and for both the volt/time curve rises steeply for short times; consequently they may not protect transformer insulation against very steep fronted waves. The surge diverter (consisting of spark gap and non-linear resistor in series) on the other hand, due to the special construction of its spark gap, has a volt/time curve which is substantially flat (Fig. 11). It is however expensive compared with a rod gap.

The spark gap in a surge diverter is arranged so that under normal conditions power frequency voltage is not applied to the non linear resistor, which can consequently be very short time rated. The resistor is generally of silicon carbide material which has a resistance inversely proportioned to about the fifth power of the applied voltage; a diverter volt/amp curve is shown in Fig. 12. Compared with the surge voltage, the power frequency voltage impressed across the diverter after a surge has been discharged is small, the resistance is high, and the power frequency current passed by the non-linear resistor is very small indeed. It is, in fact, sufficiently small that at the first current zero the arc in the spark gap goes out and the diverter again becomes an insulator; thus no earth fault remains on the system.

REFERENCE

* Chadwick, A. J., Ferguson, J. M., Ryder, D. H., and Stearn, G.: Proc. I.E.E. 1950, Vol. 97, Part II, p. 737.

(To be continued)

PROBLEMS AND PRACTICE in Engineering

Flickering Lamps

THE notes on the above fault in October 15 issue reminded me of a complaint received from an office block, some time ago, of severe lighting flicker. Investigation showed the fluctuations to be at a low frequency for periods of about 5 minutes followed by normal conditions for 10 minutes or so when the pulsations again occurred. The supply to the building was 3 phase 4-wire with cable of ample capacity for the installed load, and the flicker being on all phases indicated the cause being of external origin.

The supply was taken from a switchboard situated in a pump-house some 400 yards away, and from this board circuits to a hydraulic pump and air compressor were fed. The switchgear controlling the hydraulic pump was fitted with an ammeter which gave a slightly pulsating reading but of insufficient magnitude to account for the lighting fluctuations. The air compressor was next examined and having no ammeter in circuit a "tong test" reading was obtained which revealed quite heavy beats during the duty cycle (the motor was automatically controlled by means of an air pressure switch) coinciding with the intervals between the lighting flicker, which made it apparent as the source of the trouble.

The air compressor when running was noisy, hiding any unusual motor sound, but there was a definite vibration which synchronised with the ammeter beats, and as symptoms of a motor running with an open circuit in the rotor are fluctuating torque, noise and stator circuit pulsations, the compressor was stopped for examination. Rotor starter resistances and contacts, slip rings and brush gear were examined in turn, but without result until eventually a high resistance in one phase was discovered in the cables connecting starter and rotor, and traced to a cable lug from which the solder had melted, loosening the cable and arcing had taken place.

The necessary repair was made and the plant put back into service, the "tong test" now showing a slight beat corresponding to the pumping strokes and the office lighting normal. The automatically controlled air compressor started on no load, load being applied by the energising of an air valve on the closure of the final rotor contactor. The load current was 60 amps, which for a 50 hp motor was about 80% full load, and being applied only when the motor had reached nearly synchronous speed accounts for it running without apparent trouble except for the symptoms referred to.—*T. H. Snelson.*

C.T. Secondary Circuits

IT is worth while once more making the point that the secondary winding of a current transformer which is "on load" must not be open-circuited. Several ill-effects may arise as a result of such open-circuiting. The current transformer, which normally has but little impedance in the supply circuit, now offers a serious impediment.

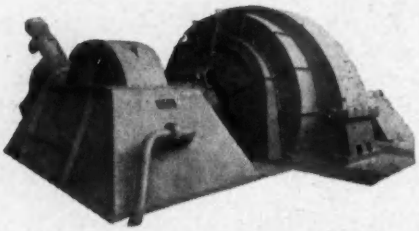
The voltage across it rises and so, too, does the voltage of the secondary—instead of a few volts hundreds, or in some cases even thousands, of volts may appear. As further possible consequences to the transformer, excessive heating, breakdown of insulation and permanent alteration in the performance (affecting accuracy) are not unlikely.

Open-circuiting may be obvious by non-response of instruments in the secondary circuit or fizzing noises. In a serious case smell and violent noise from the transformer may be evident. A menacing possibility is that the fault in the circuit may *not* become evident—it may be intermittent, or (for example) affect only one phase in a multi-phase apparatus and not show itself.

A useful facility in a c.t. secondary is a linking means by which the secondary supply may be "shorted" whenever work must be carried on in the circuit proper; many portable transformers have a secondary shorting means near the secondary terminals—this is worth adding if it does not exist.

For a c.t.-operated meter a test-block may be fixed to enable a measuring instrument to be series-connected—linked terminals being used and the link opened after connection of the temporary instrument.

It is particularly necessary to ensure that the means of connection at the test-link terminals and at the terminals of the instrument is positive and cannot possibly pull out or off, and that the apparatus and the connecting leads cannot be stumbled over or interfered with. A warning notice is desirable.—*G.E.M.*



No. 1 generating set at Cavado (Vila Nova)

PLANT for PORTUGAL

British Engineering work in large hydro-schemes

THE work carried out by the British Group (The English Electric Export and Trading Co. Ltd., and Metropolitan-Vickers Electrical Export Co. Ltd. acting together) in Portugal is of considerable importance. This work includes the supply of mechanical, hydraulic and electrical equipment for the generating stations at Castelo do Bode on the River Lezere and at Vila Nova on the River Cavado. Later a contract was placed for the substation at Castelo do Bode and more recently a further contract from the plant and equipment at Cabril.

The Zerere river, a tributary of the Tagus has a most irregular flow. To control this flow, four dams with associated power stations are to be, or have been, built at Cabril, Bouca, Castelo do Bode and Constancia. The first of these to be completed was at Castelo do Bode, as this point provides the largest water storage and has the advantage that at the same time it gives maximum regulation of the river flow.

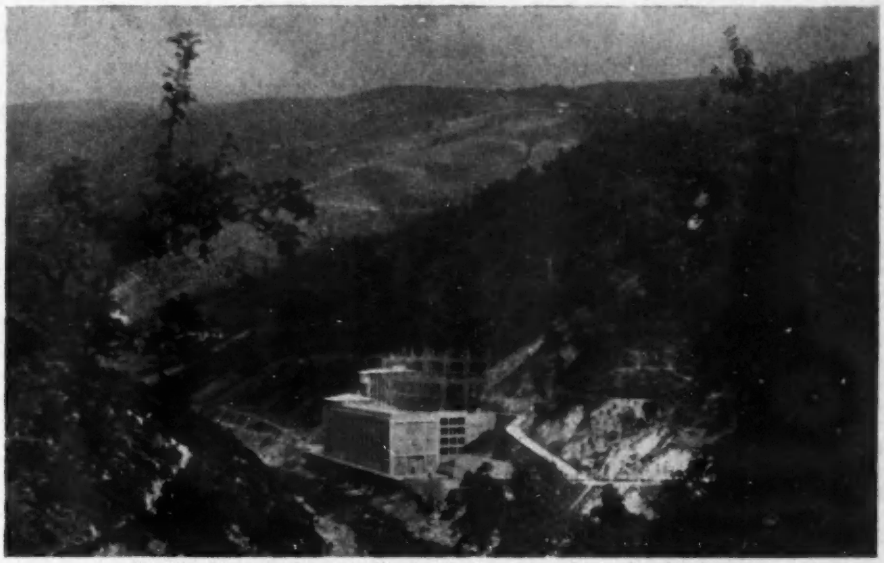
Water Shortage

The Castelo do Bode dam here is 377 ft high and has a flood spillway designed to deal with a discharge of 144,790 cusecs. With a maximum gross head of 312 ft and a storage capacity of 37,787 million cubic feet the project is one of the largest of its kind in Europe.

The Vila Nova scheme takes water from the River Rabagao which has been dammed to provide a storage of 3,249 million cu ft. Water flows first through a 6,403 ft long tunnel and then via a pipeline 2,832 ft long and 8 ft 6½ in. dia. to the power station situated on the bank of the River Cavado. The maximum head in this case is 1,362 ft.

Both Castelo do Bode and Vila Nova are now in commercial operation, the total generating capacity being some 268,000 kVA. At the former, three turbines are installed each with a normal rating of 62,000 h.p. under 262 ft head, or 73,000 h.p. under the maximum head of 312 ft. The turbines are of the vertical reaction type with plate steel spiral casings. Two-bearing vertical shaft alternators are coupled to the turbines and are rated at 57·4 MVA at 0·786 p.f. They generate at 15·5 kV 3-phase 50 c/sec. These sets are also designed to run as synchronous condensers having an output of 40 MVA at zero p.f. (over-excited). For this purpose the water level in the draught tube has to be kept below this runner level at all tail race levels, and this is achieved by admitting to the draught tube compressed air from a large air receiver and special compressor set. Governors are of the automatic oil pressure type having motor-driven pendulum actuators.

Three 32 MVA Pelton type generating sets installed in the machine hall of the Vila Nova power station



The Vila Nova power station lies in the deep gorge of the Cavado river

The rotor weighs 240 tons, and was transported to the site in sections—a procedure also carried out for the stator. Although the normal speed is 214 r.p.m. the set has been designed to withstand a maximum runaway speed of 400 r.p.m. For installation purposes, a 260 ton travelling crane has been erected in the power station and was supplied by Sir William Arrol and Co. as subcontractors to the British Group.

Air operated brakes are provided to bring the set to rest quickly and prevent damage to the thrust pads due to rotation of the rotor at slow speeds. The brakes are also used with high pressure oil to jack up the rotor for maintenance.

Set auxiliaries and common services are supplied from one of two water turbine auxiliary sets, one being standby to the other. Both these sets are automatically controlled for starting up and shutting down; thus on failure of the low tension supply from the set in service the standby automatically comes into operation. The auxiliaries are horizontal reaction turbines driving 1,125 kVA 380 volt generators at 1,000 r.p.m.

The main transformers are located on a platform downstream of the machine and are rated at 52·5 MVA with a voltage ratio of 15·5/165 kV at full load (0·85 p.f.). Delta connection is used for the l.v. windings and the h.v. windings are in star with the neutral point solidly earthed.

Connection to the transformers from the generators is by 15 kV 2,200 amp bare copper busbars supported on porcelain insulators and running through chambers in concrete. These chambers are connected by a set of three-phase 2,200 amp transfer bars, run in a concrete tunnel. A sheet steel link cubicle in each generator-transformer circuit enables, during an emergency or maintenance, any generator to be connected through the transfer bars to a transformer other than its own. Interlocked control switches in these cubicles change over the secondary and indicating circuits with the links.

From the transformers, 165 kV connections are taken to a terminal assembly on the power station roof, and thence by stub lines, 2,600 ft long, to the substation which contains the generator breakers. Surge diverters are connected to each generator circuit.

The substation forms the nodal point of the Zezere system, and duplicate busbar switchgear is used for both 165 kV and 66 kV circuits. Air-blast circuit-breakers are used on both voltages, and the 165 kV breakers are equipped for a single high-speed reclosure with a "dead time" adjustable between 10 and 50 cycles. If a fault persists after the reclosure, the breaker re-trips and locks out. Facilities are provided for both single-phase and three-phase reclosure with selective control of the system required.

Breaking capacity of the 165 kV units is

2,500 MVA, and of the 66 kV is 1,000 MVA. Compressor plant is housed on the substation site and is designed for future requirements at 165 and 66 kV. This plant is entirely automatic in operation.

Station Arrangement

The power station has been built at the foot of the dam, and the spillway comes down on one side of the power station building. All the penstocks for the main and auxiliary turbines and the scour culverts are embedded in the dam structure. There are two scour culverts, one on each side of the station and each is connected to a disperser valve capable of discharging some 150 tons of water per second under a maximum head of 312 ft. In order to avoid the erosion to the banks of the narrow gorge and the river bed the tremendous energy of this discharge is dispersed by converting the solid jet into a hollow cone.

Inlet valves of the "straightflow" type, believed to be the largest in the world, control the flow of water into the main turbines. Each valve has a bore of 11 ft and together with accessories weighs about 160 tons.

The machine hall is of the single floor type which makes all the machinery accessible and enables it to be handled by the main crane. A control room has been built on the first floor upstream of the machine hall and overlooking it.

Vila Nova

At Vila Nova, the three generating units are of the horizontal impulse type with four jets and twin runners overhung from each end of the generator. The nominal rating at 1,300 ft head is 36,000 h.p. but 39,000 h.p. is attained at the maximum head of 1,360 ft. The runners are cast in one piece, i.e. with integral buckets, in stainless steel. Cast steel nozzles, with stainless steel diffusers and spears having renewable points of stainless steel are used in the jet assemblies. A special feature is that the set is brought to rest quickly by means of a braking jet of water applied to the runner. Each set has an automatic oil pressure governor, the actuator being gear driven from the alternator shaft.

Separate Exciters

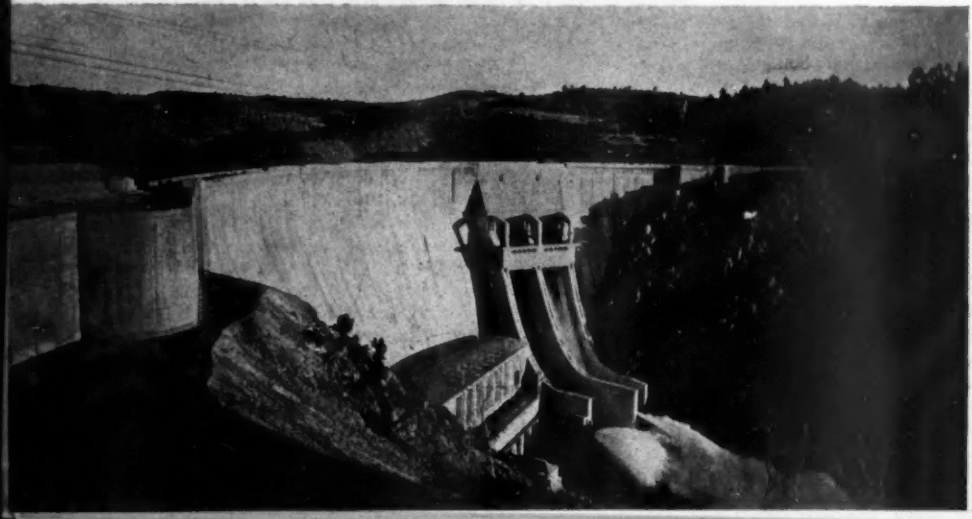
A separate exciter set is provided for each generator. These consist of a driving motor, main and pilot exciters and a flywheel to smooth out the field forcing peaks and to provide stored energy for maintaining the excitation should the generator voltage, and hence the driving motor supply, which is obtained from a unit transformer, collapse under fault conditions.

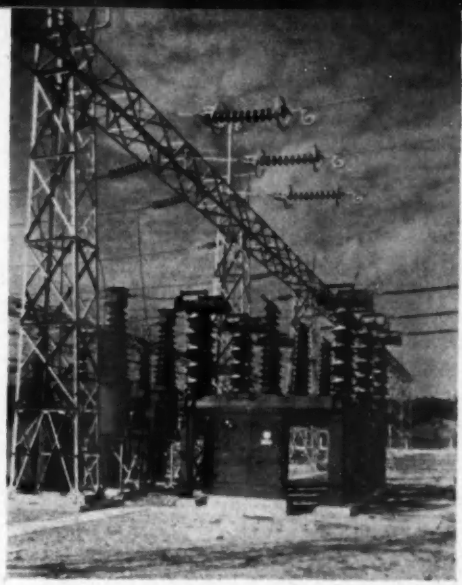
Owing to transport difficulties the main transformer for each set consists of a three-phase direct-connected group of single phase units. Each bank is rated at 30 MVA and has a voltage ratio of 11/165 kV at full load.

An auxiliary set, impulse turbine driven, is provided but, the low tension services are alternatively supplied from auxiliary transformers taking power from an external 30 kV system. For each of the units, auxiliary supplies are derived from a unit transformer.

As at Castelo do Bode, the generators are connected directly to the transformers by copper bar running in ducts. Links and transfer bars are provided in these connections to enable any generator to be connected to any

Castelo do Bode power-house and dam





On the left is a 165 kV circuit breaker at Castelo do Bode. Below is a 52·5 MVA 3-phase main transformer at the same station

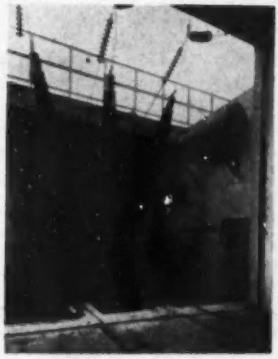
delta. The generators have 11 kV/110 volt transformers for synchronising, etc., making use of delta/star phase-shifting intermediate voltage transformers.

These stations are the result of legislation introduced by the Portuguese Government toward the end of the war, dealing with industrial reorganisation and electrification of the country. To give effect to the legislation, three companies were formed—the Hidro-Electrica do Fezere and the Hidro-Electrica do Cavado to handle the production of electrical energy, and the Companhia Nacional de Electricidade to be responsible for transmission to the main demand centres.

main transformer bank or to the water resistance tank.

Station switchgear includes 33 kV air-blast circuit-breakers in stonework cells. The 33 kV circuits connect to a supply from the nearby hydro-electric station of Ermal.

In the outdoor 165 kV substation are three generator circuits, bus coupler, and outgoing feeder to Oporto with space for a fourth generator and a fourth feeder. Construction is in duplicate busbar arrangement with tubular conductors and interlocked off-load selection, all supported by post insulators on galvanised stell structures.



Each circuit-breaker is of the air blast type, rated at 600 amp and having a breaking capacity of 2,500 MVA at 165 kV and—with the exception of the bus coupler breaker—are complete with oil-immersed porcelain-clad wound-primary type current transformers.

The Oporto feeder breaker is equipped for single-phase and three-phase high-speed single-shot auto-reclosure with dead times adjustable from 15-60 and 10-20 cycles respectively.

Station type 165 kV surge diverters are included for each transformer group, and there is a three-phase 165,000/110/110 voltage transformer on the feeder for metering, distance protection and synchronising. This transformer comprises three single-phase units, line-to-ground connected star/star/

CONTRACTORS PRINCIPAL

Castelo do Bode

Water turbines, inlet valves, main and auxiliary generators, and disperser valves.—English Electric Co.

Transformer, switchgear—Metropolitan-Vickers Electrical Co.

Cables and Lines.—British Insulated Callender's Cables.

Vila Nova

Water turbines, valves and switchgear.—English Electric Co.

Generators and transformer.—Metropolitan-Vickers Electrical Co.

Castelo do Bode machine hall

U.K. Plans for Nuclear Power

B.E.A. Should Have Reactors In Few Years

BRITISH plans for the next few years of development of nuclear power in electricity were revealed by Sir Christopher Hinton in a speech delivered in New York on Friday last. Sir Christopher, who is Head of the Ministry of Supply Atomic Energy Production Establishment at Risley, Lancs., was addressing the U.S. National Industrial Conference Board, and his speech was made against the background of an earlier U.S. announcement that the Atomic Energy Commission were to construct a power reactor to produce a minimum electrical power output of 60 MW within three to four years.

Britain has recently started to construct a thermal reactor from which power will be produced in industrial quantities, and expects shortly to be starting on a fast reactor (one having a core of plutonium or of enriched uranium). The thermal reactor is graphite moderated and is cooled by circulating carbon dioxide under pressure. It is enclosed in a mild steel shell within a thick protective shield and boilers are arranged around it. These supply steam to a turbo-alternator plant of conventional design. It would have been preferable to use helium as a coolant, but helium supplies for this purpose were not available.

Generation of power for supply to the Grid is hoped for "within the next few years," and A.E.P.E. believe that it may then be possible to suggest to the British Electricity Authority that they should build additional reactors, having them designed and constructed by the power plant industry of the country.

Cost Analysis

A cost analysis does not suggest that electricity generated from atomic energy will be uncompetitive in price. It is considered that the cost of electricity generation in conventional stations will continue to rise, while that of nuclear-based electricity will fall. Moreover, in making these cost comparisons, there is no allowance for the value of fissile material which will be created in the thermal reactors, and which can be extracted and eventually used as fuel in fast breeder reactors.

There are likely to be three stages of development. First of all, a series of thermal reactors are to be constructed which will both generate power and produce fissile material. This fissile material can then be used as a fuel in fact reactors, giving a second period in which thermal reactors and fast reactors run side by side to generate electrical power. In the very long term, reliance will probably be placed on fast reactors, which should breed at least enough new fissile material to make them self-supporting.

Alternative Types

The reactor now being built is only one of many types which may prove useful during the first period. It is intended that the Harwell research department shall proceed to examine alternative types of reactor, and select the next most promising type, and carry out initial design and development work in connection with it. The Production Division will pick up the industrial design of this reactor when they have handed over to industry the gas cooled reactor and they will then construct a first model of this alternative type of reactor, and in turn hand that on to industry for operation and further development.

Three major difficulties exist in connection with this plan of development. Firstly, supplies of uranium are scarce; secondly, there is the problem of disposing of fission products; and thirdly, there is the problem of designing reactors which are inherently safe. Probably the last of these difficulties is the most important. The magnitude of the disaster in the event of a reactor explosion is so great that no responsible engineer or industrialist could contemplate taking the risk. What is needed is more information about the effects of an accident. At present the only reactors whose erection in a reasonably populated area can be contemplated, are thermal designs that are gas cooled; are heavy water moderated and cooled; or use enriched uranium and are light water moderated and cooled.

Sir Christopher completed his speech with an appeal to America to make the experiment of building a reactor in some remote part of their great country, merely with the intention of letting it run away, and seeing what happened. Such a test would cost no more than the trial of a single atomic bomb, and it might give information of tremendous value.

The Dairy Show

Greater scope for Electricity

EVERY phase of the dairy industry was illustrated by displays at the 67th Dairy Show held at Olympia last week.

Starting from the preparation of fodder and controlled grazing the story carried on with the prize livestock themselves, milking apparatus, cooling, pasteurisation, bottling plant to delivery vehicles and machinery for the production of milk products, e.g., cream, butter, cheese, condensed milk and ice cream.

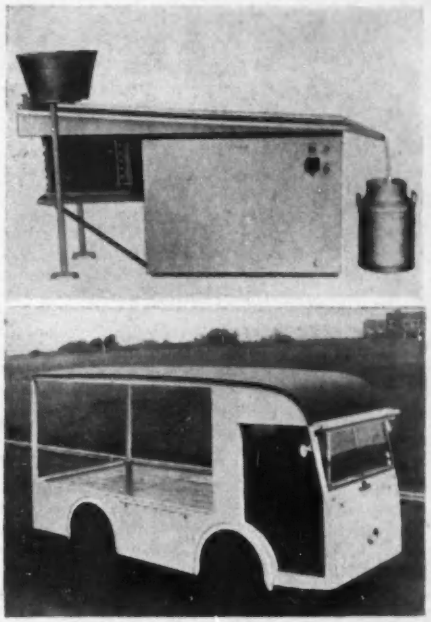
The Electrical Development Association are always present at the show. Their theme was "Electricity for steam, hot water and refrigerated cooling," and equipment was shown covering the requirements of two types of dairy farmers, those having herds of up to 20 cows and those with 40 or more. Electric steam raising, water heating and refrigerated cooling equipment suitable for dairies following bucket milking or in-churn techniques and vacuum cooling plant for recorder-milked herds, churn cooling and sterilising plant for the smaller mobile unit milkers were on view.

New exhibits on the stand of the General Electric Co. included two infra-red heating units for pigs, poultry and other farm stock. These comprise a 250 W single lamp unit and a 300 W dull-emitter type.

Two new Genalex farm food cookers are also on display. One model is available of 18-54 gallons capacity or 1¼-2¼ cwt. Slung on trunnions on a firm stand this model has double casings and lagged lids to conserve heat. A safety cutout is fitted. The second model is a pressure-type cooker 36 gallons capacity and loaded at 6 kW.

A new development in milk cooling is the tray model cooler developed by Purlac, Ltd. It consists of a standard cooler where the refrigerating unit has been removed from the top to the side. On top of the iced-water tank a large tray has been placed which receives milk from a hopper. This milk runs down the tray and into the churn. The cooling takes place whilst the milk is running over the tray on the bottom of which is playing a series of ice-water jets. This machine cools 80 gallons per day and is seen above.

Electric vehicles are widely featured at the show. Available on each manufacturer's stand and at E.D.A.'s are copies of the



Electric Vehicles Association's new booklet in support of their use. Austin Crompton-Parkinson Electric Vehicles featured a new 20 cwt chassis with wider, stronger axles and frames, improved springing, increased driver vision and a turning circle of 31 ft—8 ft less than previous models. The batteries are retractable through side body panels whilst high and standard speed axles are fitted to choice. The new dairy model is in two forms, one seen above, having short or medium deck with capacities of 175 cu ft and 210 cu ft respectively. Smiths Electric Vehicles have their popular 30 cwt N.C.B. electric dairy truck and the 3-wheel Percheron 25 cwt truck.

Batteries for these vehicles are featured. D.P. Battery Co., Ltd., with a range of "Kathanode" batteries incorporating "Porvic" separators, and by Tudor Accumulator Co., Ltd., who have a series of Tudor traction batteries also fitted with Porvic separators.

Another new battery on show is the 6 volt air depolarising dry battery designed by Wolseley Sheep Shearing Co. to operate their electric fence for six months.

Westalite chargers for charging electric vehicle batteries are the main feature of the Westinghouse Brake and Signal Co.'s display. This range of equipment is available in three frame sizes for floor or wall mounting.

overseas news

Inquiry into Avalanche

At an inquiry by a Royal Commission to find the cause of the rock and mud slides at Whatshan power station of the British Columbia Power Commission last August which almost wrecked the $5,800,000 plant (as was earlier reported), Mr. S. R. Weston, chairman of the Power Commission, stated that it was his opinion that faulty rock formations had been indirectly responsible for the mud slides. He admitted that the contractors building the two-mile tunnel had run into difficulties with the rock formation soon after they started. In his opinion, leakage through the rock faults had allowed water to seep out of the tunnel and loosen earth on the slope above the power plant. Later, Mr. A. W. Lash, chief engineer for the Power Commission, said he called for tenders for the Whatshan tunnel without first obtaining a geological survey. This he still felt was a sound plan, for he doubted that even a most competent geologist could have determined the exact quality of each type of rock likely to be encountered.

Urgent Research Needed

After the full scale development of the St. Lawrence and Niagara power projects—the last sources of hydraulic energy available to the manufacturing centres of Ontario, the Hydro Electric Power Commission of that province must look almost entirely to thermal sources of electrical energy in the near future, Mr. R. H. Saunders, chairman of the Commission has stated. He was commenting on the likelihood of early industrial application of atomic power. Thermal power today costs over twice as much as hydraulic power. It was to be hoped that an intensive programme of research and development and the fullest co-operation of government, industry and the utilities would result in nuclear energy being available as electricity at a cost which would contribute to the standard of living not only of future generations but of this generation, he added. Time was of the essence.

Newfoundland Expansion

To provide for development already planned the Newfoundland Light and Power Co. is increasing its authorised capital from $2·4 million to $3·5 million. The company distributes electricity in the most populated parts of Newfoundland and is at present expanding its facilities at Piper's Hole. With an ultimate potential of 70,000 h.p., the project is to be built in three stages, the first section of 30,000 h.p. being scheduled for operation by 1955. The plant will supply power to Bell Island and St. John's.

Another Low Tender

The English Electric Co. has submitted the lowest tender for the supply and erection of two 73,684 kVA generators for the McNary dam powerhouse, Walla Walla, Washington, it is reported. The firm's price is $3,651,476, we understand. All the other tenders were from American concerns. The power scheme is being undertaken by the U.S. Army Corps of Engineers, and these tenders are being referred to the Secretary of that organisation for his recommendation.

Norway's Bright Outlook

Since the war, Norway's hydro-electric generating capacity has increased by about 1,000 MW, according to a survey recently published by the Norwegian Government. The increased capacity has also been better utilised, so that the production of electricity is now almost twice as much as before the war. In 1939 the capacity of hydro-electric plants in Norway was 2,110 MW; by last year it had been raised to 3,300 MW. Output of the plants for those two years amounted to 10,500 million units and 18,900 million units respectively. There has also been an increase in the number of consumers, of course, and by last year 88% of the population were using a supply compared with only 75% just before the war. In addition the production of electricity per head of population of about 5,700 units a year, is greater than any other country in the world, yet it is estimated that Norway still possesses power sources capable of producing a further 120,000 million units annually—more than six times as much as is produced at present.

100 MW Atomic Station

Holland is the latest country to report plans for the establishment of an experimental atomic power station. This station is to have an installed capacity of 100 MW, it is stated, and it is expected that power will be produced on a fairly large scale within five to eight years at a cost approximately the same as by coal generation. The organisations responsible for the scheme are F.O.M., the Dutch institution for fundamental research of materials, of Utrecht, and K.E.M.A., the national electrical research station of Arnhem.

Consultants for Kafue

The Anglo-American Corporation of South Africa Ltd. has been appointed by the Kafue River Hydro-Eelectric Authority as consulting engineers in chief for the construction of the Kafue

scheme, it has been announced. Commenting on this, Mr. R. A. Nicholson, chairman of the Authority, and economic secretary to the Government of Northern Rhodesia, stated that they considered that the co-ordination of the construction of the scheme could not be placed in better hands. The Corporation would be entirely responsible to the Authority for the technical construction of the power scheme, he added. The Anglo-American Corporation of South Africa Ltd. acts as secretaries and consulting engineers to many concerns and is largely interested in South African gold mining companies, in Northern Rhodesian copper undertakings and in the diamond industry. The report of the Kafue hydro-electric project was originally prepared by a panel of British consultants composed of Sir William Halcrow, Mr. Harold Gourley, Mr. C. H. Pickworth and Mr. Geoffrey Kennedy. The output of the project is primarily intended for the Northern Rhodesian copper mining concerns, and for the Electricity Supply Commission of Southern Rhodesia. Estimated output of the project has been put at over 200 MW initially.

Advisory Committee

The Government of India have decided to appoint a Technical Committee to advise on irrigation and power projects to be included in the second Five-Year Plan. This Committee will make recommendations to the Planning Commission, which will determine priorities. The Committee, which will be known as the Advisory Committee on Irrigation and Power Projects, will examine schemes proposed by State Governments and ensure that they have been prepared after detailed investigation, that estimates are correct, and that the financial forecast is reliable. The Deputy Minister for Irrigation and Power will be chairman of the Committee.

New Laboratory

Mr. Nehru recently laid the foundation stone of the Central Electronics Engineering Research Institute, at Pilani, the twelfth in the series of national laboratories being built by the Government of India.

Victoria's Expenditure

By the end of this financial year the State Electricity Commission of Victoria will have spent £A13,750,000 on Pyrmont power station, the State Premier, Mr. Cahill revealed a few days ago when tabling the Loan Estimates in Parliament. At Pyrmont two of the four 50 MW sets went into commission during the last financial year; the third unit is expected to operate this year and the fourth in 1955. The Railway Department would spend £A2,407,000 on rail electrification—chiefly on the Western line to Wallerawang. The Department hoped to finish the electrification by the end of 1957. The total cost of electrification of the line and associated construction works between Sydney and Wallerawang is estimated at £A13,000,000, he added.

Control of Snowy Project

Some measure of control over the Snowy Mountains hydro-electric project has now been obtained by the New South Wales and Victorian Governments. This was agreed to at a meeting last week when it was also accepted in principle that the Commonwealth Government should get the approval of the N.S.W. and Victorian governments before proceeding with further stages of the scheme, including the Adaminaby-Upper Tumut section for which tenders have already been invited. In view of the substantial increase in costs since the original estimate, technical experts of the three governments are to make an immediate investigation into estimated costs of the scheme. The present estimated total cost of the project is £A600 millions compared with the original £A225 millions in 1949. The Commonwealth government points out that power generation costs will be two-thirds of that of thermal stations. But with the intention of keeping down costs, the two states want the right of veto over construction work. Victoria in particular, is concerned at the use of capital and materials which it more urgently needs for its own Kiewa hydro-electric scheme, we gather. The Commonwealth also has yet to conclude a firm agreement with the two states for distribution of both power and water, for meeting operating costs and for establishing an operating authority as each stage of the project is completed. The Commonwealth has been insisting that power charges should cover the full costs of the scheme and provide for sinking fund and interest. The two states consider that charges should not be higher than for electricity from thermal stations.

Criticism of Roxburgh

The New Zealand Government's handling of the Roxburgh hydro-electric project was strenuously attacked by Opposition members during a debate in the House of Representatives last month. The Minister of Works, Mr. Goodman, while admitting that the work was not going as well as it should, denied that the Government had anything with which to reproach itself as far as Roxburgh was concerned. There were six major projects, including Roxburgh, under way in New Zealand at one time, he explained. This resulted in the Roxburgh project being very understaffed. A sufficient labour force was not available for Roxburgh without weakening the organisation on other projects. Eight tenders were received for Roxburgh and that of a leading British firm of contractors was accepted. However, it was found that the firm was not experienced in hydro-electric work, so it was associated with a Swiss construction firm with an impressive record of hydro-electric construction. The estimated total cost of the scheme was £8,620,714. If the contractors had two generators operating by July 1955 they earn a £250,000 bonus, he stated.

PERSONALITIES

IN THE INDUSTRY

On Monday next, **Mr. H. W. Wilson,** manager of the Southampton branch of the General Electric Co., Ltd., will take up a new appointment as an assistant to Mr. W. T. Bird, the London sales manager. His successor as manager of the Southampton branch will be **Mr. D. E. Kidner.** Mr. Wilson joined the company in 1924 and, after serving successively with the refrigerator, engineering and sales departments between 1927 and 1936, was then made assistant manager of the Southampton branch, of which he became manager two years later. Mr. Kidner was educated at Barking Abbey School and gained his initial experience in the industry with Falk, Stadelmann and Co., Ltd., but joined the G.E.C. cooker department in 1936. After war service he returned to that department in 1945, but was later transferred to the London sales department where for some years he was engaged in the company's business with the South Eastern Electricity Board.

Mr. D. E. Kidner

Two senior officials of the Victorian State Railways are due in Britain from Australia on November 15. They are **Mr. C. V. H. McDonald,** assistant chief electrical engineer, and **Mr. J. Butterworth,** the rolling stock engineer. Primarily their visit, which will occupy several weeks, is to complete arrangements for the construction of suburban trains, for which the coaches and their electrical equipment have already been ordered from British firms. In addition they are also to investigate the possibility of utilising fluorescent lighting in the coaches, in which connection they are also to visit the Continent, we understand.

Mr. T. H. Atkinson has joined the Thermovent Heating Division of E. K. Cole, Ltd., as technical sales representative covering the South and South Eastern area. He is already well known in that area, having until recently represented Parnall (Yate), Ltd.

Cable and Wireless, Ltd., have appointed **Mr A. Findlay** as superintendent marine engineer in succession to **Mr. J. Armstrong,** who retired at the end of October after 31 years' service with the company. Mr. Findlay, who has been assistant superintendent marine engineer of Cable and Wireless, Ltd., since November 1951, has been succeeded in that position by **Mr. L. Roy.**

Philips Electrical, Ltd., announce new appointments in the radio and television sales organisation. **Mr. J. T. Moore,** who was assistant sales manager in the Northern area, has been appointed assistant sales manager for the whole of the country, and will in future operate from the head office at Shaftesbury Avenue. **Mr. H. L. Adderley,** who has been the company's representative in Lancashire and Cheshire, has been appointed Northern sales executive. The company also announce that **Mr. F. S. Sheridan** has been appointed radio and television representative in the area covered by the Newcastle branch. He previously operated in the Yorkshire area. He will be taking over the territory of **Mr. F. K. Haddon,** who is retiring in December.

The Hydro Electric Power Commission of Ontario has nominated new deputies to the Commission's assistant general managers. **Mr. G. D. Floyd,** director of the Planning Division, has been promoted to deputy to **Dr. Otto Holden,** assistant general manager in charge of engineering, and **Mr. J. M. Hambley,** director of operations, has been appointed deputy to Mr. A. W. Manby, assistant general manager in charge of administration. As a result of these promotions, **Mr. M. H. Mackenzie** succeeds Mr. Floyd in the Planning Division, and **Mr. C. B. Sharpe** assumes Mr. Hambley's former power in operations.

We hear from George Pike, Ltd., that **Mr. T. J. Goddard** has now left the company, and they have appointed **Mr. R. S. Emery** as the new manager for Scotland. Mr. Emery received his training at the firm's Bristol office, and on returning after war service took up an appointment as a representative attached to their Cardiff office.

The British Plastics Federation has for the first time elected a president, as allowed in its constitution. The president is **Mr. C. F. Merriam,** chairman of the British Xylonite Co., Ltd. Mr. Merriam, who followed his father and grandfather as head of the business, joined the company in 1905, becoming joint managing director with his father in 1919 and chairman in 1933. He has spent all his working life in the British plastics industry and is a past-chairman of the British Plastics Federation and a vice-president of the Association of British Chemical Manufacturers. He retired from full-time work with his company last year.

Mr. C. F. Merriam

Evershed and Vignoles, Ltd., now inform us that the business visit of their export sales manager, **Mr. H. W. Griffiths**, A.M.I.E.E., M.S.M.A., to Pakistan, India, Ceylon and Burma, to which we referred last week, has had to be postponed until 1954, owing to unforeseen circumstances.

The Northern Aluminium Co., Ltd., announce the following changes in their Sales Department: **Mr. F. Layton** is to take charge of the Sales Administration Department at Banbury, being succeeded as manager of the Leeds area sales office by **Mr. H. M. Louch.** Mr. Louch's previous position as sales development manager is to be held by **Mr. E. D. Iliff,** at present publicity manager, and the Publicity Division will be in the charge of **Mr. R. F. Taylor.**

The Department of Scientific and Industrial Research has appointed **Mr. R. O. Jones** as their first resident liaison officer in Wales. He is to study the industrial position in Wales with a view to assisting in the identification of industrial problems amenable to research and in the application of existing knowledge and research facilities to meet Welsh needs.

The first annual dinner was recently given at Slough by the directors of the Rheostatic Co. Ltd. to those employees who had served for 21 years or more with the company. The dinner was presided over by **Mr. M. J. Gartside**, chairman and managing director, who has himself recently completed 21 years service with the company. **Mr. L. Satchwell,** who founded the company in 1921, presented on behalf of the directors, gold watches to five employees who had completed 30 years' service, including **Mr. T. N. Flight,** vice-chairman and technical director. Long-service badges were presented to seven employees who had served for 25-30 years and twenty who had served 21-24 years. Our accompanying illustration, taken at the function, shows Mr. M. J. Gartside standing on the left, Mr. L. Satchwell seated third from left, and Mr. T. N. Flight standing on the right, with four other recipients of presentations.

At Rheostatic Co's annual dinner

Mr. R. H. Gilliam, A.C.W.A., A.I.M.T.A., who since April has been Cornwall Sub-Area Accountant designate in the South Western Electricity Board, has now assumed the responsibility of Sub-Area Accountant, **Mr. W. F. Sandry** having retired after 42 years' service to electricity supply in Cornwall. Mr. Sandry joined the Cornwall Electric Power Co. in 1911 as a cost clerk, and became first assistant to the chief accountant in 1929. He succeeded the late Mr. A. L. Gray as Cornwall sub-area accountant in 1950.

Mr. W. F. Sandry

Mr. Gilliam, served with the East Sussex County Council, Liverpool Corporation and in the Kensington Borough Treasurer's Department, before joining the South Western Electricity Board as technical assistant in the Chief Accountant's Department. In April 1950 he became assistant accountant in the Organisation and Methods section of accounts.

Mr. V. M. Graham, director of technical relations of Sylvania Electric Products Inc., has been elected a vice-president and member of the executive committee of the U.S. National Committee of the International Electrotechnical Commission. Mr. Graham has been active in standardisation work in the radio and electronic fields for nearly 30 years.

At the end of this month **Mr. F. E. London** will be taking up an appointment as representative for Venner, Ltd., in the Yorkshire and North Eastern Electricity Board areas. He commenced his career with the firm in the Switchgear Assembly Department in 1936, and after transferring to Air Ministry contract work and then to the Service Department, gained further experience with a period on outside servicing on time switches and nearly two years in the Sales Department.

The Minister of Fuel and Power has appointed **Mrs. C. Renton-Taylor,** to be a part-time member of the Yorkshire Electricity Board. She is chairman of the Leeds branch of the Electrical Association for Women.

OBITUARY

Mr. W. C. Crane, section head in the Commercial Department of the Western sub-area of the London Electricity Board, died on October 23. He started with the former Brompton and Kensington Electricity Supply Co. in 1913, of which he later became sales manager, and when that concern was merged with other London companies in the Central London Electricity Ltd., he was appointed district sales manager for the Kensington and Brompton area.

Mr. H. Gawthorne, who was a director of Brookhirst Switchgear, Ltd., until his retirement in January this year, died on October 25. He joined the firm as personal assistant to the late Mr. J. A. Hirst in 1905, was appointed secretary to the company in 1920 and became a director in 1937. He also later held a directorship in the associated company Ferrous Castings, Ltd. Mr. Gawthorne was a past President of the Chester and District Association of the Engineering and Allied Employers' National Federation, and Chairman during the last war of the Chester and District panel of the Emergency Services Organisation.

Mr. H. Gawthorne

Mr. H. J. Hornby, chairman and managing director of A. Gallenkamp and Co. Ltd., died on November 2, aged 68.

Mr. H. Baines, K.B.E., formerly chief electrical and mechanical engineer of H.M. Office of Works, died on November 1, aged 79.

Mr. J. Ross Stevenson, M.I.E.E., formerly senior partner in the Edinburgh electrical engineering concern of that name, died on October 30 in his eightieth year. His Edinburgh business was started in 1905, but earlier he had been a partner in the Taylor Smith Electric Co., after gaining experience with Mavor and Coulson, Ltd.

Mr. A. Clements, who was for over fifty years assistant secretary to the British Thomson-Houston Co. Ltd., died on October 26, aged 82.

Mr. W. A. Jackson, O.B.E., M.I.E.E., M.I.Mech.E., a director of the Telephone Manufacturing Co., Ltd., and associated concerns, died on October 25, aged 68. He had travelled extensively on behalf of the company, and took a keen interest in educational matters. He gained early training and experience with Belliss and Morcom Ltd., before joining the Telephone Manufacturing Co. Ltd., and served as works manager from 1916 to 1928, when he became general sales manager, holding that position until becoming a director in June, 1939. Mr. Jackson had also been chairman of Governors, L.C.C. Norwood Technical College since 1920. He was awarded the O.B.E. in the first Honours List of H.M. The Queen in June, 1952.

Mr. W. A. Jackson

Mr. G. W. Clarke, A.M.I.Mech.E., M.In.Prod.E., who was the manufacturing engineer responsible for apparatus and equipment projects in the London General Manufacturing Department of Standard Telephones and Cables, Ltd., at Connaught House, died on October 1, aged 67. He started with the company as a tool draughtsman in 1912; among his wartime activities, he made an outstanding contribution to safety in the factories in connection with the operation of power presses.

Mr. W. Fitzgerald, a former district manager at Newcastle-on-Tyne for the Edison Swan Electric Co., Ltd., died recently, aged 69. He retired in 1949.

NEW LITERATURE

Faster than Thought

ed. by B. V. Bowden

THE digital computer is practically as old as the history of mathematics. In its most ancient form, the abacus, it was known to the eastern races from time immemorial, although its introduction to the western world is traditionally supposed to have occurred only 1,000 years ago. The first simple digital machine was invented by Pascal in 1642, and other devices followed. It remained, however, for Charles Babbage, more than one hundred years past, to enunciate the fundamental principles on which the modern digital high-speed computer are based, and indeed it is only in the last ten years that his ideas have been properly appreciated. It is thus not unexpected that a considerable portion of this symposium of twenty-four authors should be devoted to the fundamental work of Babbage and his analytical engine.

Apart from its historical interest, the book provides possibly the easiest understood analysis of the capabilities and limitations of modern digital computers and their methods of operation. The intending reader need not fear he will be confronted with vast sections of advanced mathematics, nor need he have a comprehensive knowledge of electronics. All that is required to understand and appreciate the information presented, is a logical and, possibly, a philosophical mind.

Not a small part of the attractiveness of the presentation is the subtle, and sometimes cynical, humour of Dr. Bowden himself, whose writing is most delightful. Published by Sir Isaac Pitman and Sons, 416 pp. 5½ in by 9 in. Price 35s.

BOOKS RECEIVED

Further Advice on Stage Lighting, by the Amateur Advice Section, The Strand Electric and Engineering Co. Third reprint of this publication, to which has been added a second part including tables of beam angles and relative intensities of standard lanterns. Published by the Strand Electric and Engineering Co., 29 King St., W.C.2, 90 pages, 8¼ in. by 5½ in. Price 2s. 6d.

Hoover Market New Steam Iron

and a new model cylinder vacuum cleaner

NEW appliances released by Hoover Ltd. last Monday are a brand new type steam iron and an attractive new cylinder model cleaner (417).

The iron doubles as a steam iron or dry iron; for the latter it has thermostatic heat control. Switching from either function is by a mechanical switch action in the handle.

The iron is basically in four parts—a cast alloy soleplate in which the elements are embedded and sealed through which are a series of drain holes with guide channels in the soleplate along which the steam passes.

The steam is generated in a sealed chamber immediately above the sole-plate through the action of very small drops of water fed on to the soleplate cavity through a gravity feed valve from the water tank above it. It is this valve which is controlled by the switch in the handle. The handle, of brown plastic material, is designed to shroud the metal part of the iron's base making for cool ironing. It is comfortable to grip and is provided with thumb rest on either side. The water tank is filled by means of an opening in the front of the handle. When steam ironing the iron is rested on its wide heel in which position the production of steam is automatically stopped.

Despite the nature and function of the iron its weight is deceptively small, only 3½ lbs when empty. Attractive in its brown and chromium finish the iron costs £4 19s. 6d.

The filler hole in handle and steam holes in the soleplate are clearly seen in these photos

The attractive 417 costs 22 guineas (inc. tax)

The 417 Cleaner

Many new features are embodied in the new cylinder cleaner. Finished in grey and maroon in a restyled casing, the 417 has more powerful suction, positive seal connections ensuring no loss of suction.

A new pattern swivelling carpet nozzle has a spring loaded brush set in the casting which is brought into action by quick release catch.

Connections between hose and cleaner and hose and tools are instantaneous, a simple snap fit clip seals the connections which are airtight by means of a rubber grommet inside the female connection. Specially designed tough paper "Disposall" bags are provided to fit inside the dust bag and thus provide a means of emptying the dirt without the usual mess. Dirty air passing into the cleaner leaves through four filters—once through a deodorant pad leaving freshened air.

The tool range is excellent both in range and quality. In addition to the carpet nozzle there is a flexible plastic swivelling floor brush which cannot scratch furniture, a new-angle dusting brush, a special furniture nozzle and a crevice tool.

Ten Years in North of Scotland

THE enormous developments and improvements, both economically and socially, which had followed from the first ten years' operations of the North of Scotland Hydro Electric Board, were outlined by Mr. T. Lawrie, C.B.E., general manager of the Board, in an address to the Dundee Business Club last week. At the present time 17 hydro-electric stations totalling 398 MW had been completed, he said. A further 24 power stations totalling 465 MW were in course of construction or preparing for construction to begin, and another 15 were at various stages of surveying and preliminary investigation. The stations already operating produced 935 million units annually, and the others would provide a further 2,235 million units each year, it is estimated.

Power station styles had not been stereotyped. Those at Sloy, Pitlochry and Clunie were of classical style and faced with reconstituted Aberdeen granite, and those at Affric and Grudie Bridge were built by local masons of sandstone from local quarries, while at Kirkwall native whinstone had been used for the diesel station.

In many instances amenities had been improved in addition to the advantages which an electricity supply could bring. The question of salmon had been closely studied, and every care was taken either to see that sufficient natural spawning was available or a hatchery provided, apart from providing fish passes at the dams. Agriculture was the principal industry in the area, and as a result of the Board's efforts, nearly one farm and one croft in three had been connected, but much work still lay ahead.

As to the future, he illustrated the possibility of further economic development and social improvement by describing operations in Glen Moriston. Here, where a large hydro-electric scheme would start up in two years' time, there will be an electricity supply, more sheep on the hill, expansion of afforestation, better roads and more employment not only in the glen but further afield to places like Fort Augustus where a large control centre will be built. In addition, Trief cement, made from blast furnace slag, was being used for the first time in this country in the building of two dams in the glen, thanks to the pioneering efforts of Mr. Angus Fulton, the Board's chief civil and hydraulic engineer.

GAS SUPPLY IN 1953

PROGRESS made by the gas industry in the installation of gas cookers and other appliances in new houses can be seen in the fourth Annual Report of the Gas Council published last week. Covering the year ended March 31st, 1953, the report shows that out of 56,200 of the new houses completed during the year, some 80% of the occupants chose gas for cooking. During the year, completed and occupied houses totalled 255,744.

More specifically, in Crawley New Town, 1,050 houses were completed, some 80% having gas for cooking. Gas ignited solid-fuel grates are to be found in 63% of that total, whilst 400 sink water heaters were supplied to houses depending upon solid fuel for main water heating. In the South Eastern Area as a whole, 92% of the 22,619 houses completed were supplied with a gas service, 83% were fitted with gas cookers, and approximately half the total have gas wash boilers and gas ignition for fires. The North Thames Gas Board shows figures of 86% preference for gas cooking in 18,300 new dwellings.

Foreseeing difficulties in the provision of adequate quantities of carbonisation coals for the gas and coking industries, the Gas Council, in conjunction with the National Coal Board, is examining the possibilities of blending with gas coals types not usually regarded as suitable for gas making. Its research organisation has been conducting experiments with such non-caking coals, both in Great Britain and in Germany. Results show that gasification proceeded smoothly under high pressure, the gas yield being equivalent to 85 to 88% of the coal gasified or 65 to 72% of the heat supplied. When purified, the gas had a calorific value varying between 395 and 425 B.Th.U./cu ft and the commercial operation of the process in this country is now being considered.

In another sphere, the Council, in association with the Anglo-Iranian Oil Co. and its subsidiary, the D'Arcy Exploration Co., has decided to carry out an extensive field investigation in the search for natural gas in sufficient quantities to be of commercial value. The investigation may also provide information for underground gas storage.

The BUYER'S *Column*

The "Needlelite Junior"

THE CARTER ELECTRICAL CO. LTD., Eastern Works, Eastern Ave., Romford, Essex, have recently introduced a new sewing machine motor and foot control to their already large range of fractional h.p. motors. This new motor, called the "Needlelite Junior," gives exactly the same performance as the Needlelite Sewing-machine motor which has been manufactured for many years. The Needlelite Junior is smaller and much more compact than other models, and is finished in black stove gloss enamel with nickel plated fittings. There is an independent light switch

A handsome Christmas present would be a "Needlelite Junior"

and an adjustable lamp shade. The foot control is of the carbon pile type which gives a much smoother action. The whole unit is fully suppressed, and will not affect either radio or television.

The Needlelite Junior is attractively packed in a cardboard carton, complete with all fittings ready for easy attachment to any make of sewing machine. It sells at the retail price of £5 5s. plus purchase tax, and is suggested as an ideal Christmas present for the handy housewife. The motor can be supplied in any standard voltage and gives 1/20th h.p. at 4,000 r.p.m. with a current consumption of 80 watts.

Parvalux Capacitor motor

NOW in full production and available in a range of speeds and horsepower up to 1/10th is the permanent capacitor motor introduced by PARVALUX LTD., Broom Rd., Parkstone, Dorset.

The unit is also available with single and double reduction gearboxes which between them cover a range of speeds from 0·2 to 700 r.p.m. and an output from infinity to 50 lb. torque.

This new motor is available for single or three phase supplies in normal voltage ranges and is finished in durable silver grey hammer or glossy black if specified. Weight is 5¼ lb (less condenser). The geared models are similar, weights however, being 6¼ lb and 7½ lb respectively. In these models alternative positions for the gearbox can be arranged to suit customers' requirements. The motor is suitable for running in any position and base holes are elongated to facilitate fitting. Gear wheels are of Bakelised fabric with hardened steel worms.

Automatic defrosting in New refrigerator

LATEST Model NPC-7E refrigerator by NASH-KELVINATOR LTD., Crewe, Staffs, has built-in automatic defrosting.

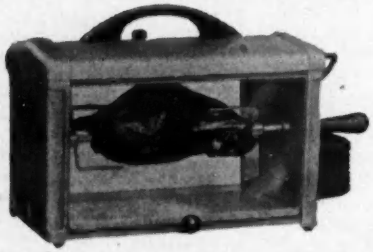
Instead of the tiresome emptying of the cabinet normally needed when de-frosting, the magic-cycle defrosting in this new model merely needs switching "on"; the rest is automatic. The push button switch seen at the top of the cabinet operates an electromagnetic by-pass valve permitting the hot gases in the system to pass through the refrigerant tubes, automatically defrosting them. When the defrosting is complete, thermostatic switching cuts out this passage of hotter air and brings in the normal cooling cycle of the refrigerator. All that is required when a small red indicator shows defrosting to be necessary is to close the baffle, leave contents in the cabinet and in the frozen food chest undisturbed and merely press the button.

This Model NPC-7E is a cabinet model with the features of refrigerator design which have made the name Kelvinator. It is marketed by Nash-Kelvinator Ltd., 53/55 New Bond St., W.1, at £142 1s. 3d.

This new model incorporates automatic defrosting

Beerex 'Spits'

ILLUSTRATED below is the portable model "Beerex" electric spit which is handled by A. E. WARNER (LONDON) LTD., 56 Brewer St.,



London, W.1. This model operates without fumes or smell and can be placed on a trolley or table in front of the customer to enable him to watch his meal being prepared. The machine will handle 2 birds weighing up to 2½ lb each or a larger bird 5-6 lb in one operation. Price is £51 (ex warehouse).

The company also handle two larger models, Model 50 which caters for 9 birds weighing 2½ lb in one operation and can be used as a salamander as well as a spit and a 60/RG model which is a combined spit-grill-salamander.

Price Reductions

PRICE reductions operative from November 1, 1953, are announced by D. S. PLUGS LTD., Manchester 5, in plugs and sockets to B.S.1363. The fused plug D.S.16 in brown is now priced at 40s. per doz., in white 44s. per doz. Flush type sockets, with brown plastic front plate D.S.17, are now 46s. per doz., in white 55s. 8d., per doz., and with metal front plate B.M.A. (D.S.18) 55s. per doz. Surface sockets (D.S.19) brown 46s. per doz. and in white 55s. 8d. per doz. Spare fuses to B.S.1362, 3, 7 or 13 amp. (D.S.20) 6s.

Selecting Winding Wires

AN easy way of finding full mechanical and winding data for winding wires has been designed by CONNOLLYS (BLACKLEY) LTD., Kirkby Trading Estate, Liverpool, who have issued five slide rules which give all the information required by designers of electrical equipment and can be easily kept at hand, obviating the need for bulky tables.

The range covered by the five slide rules is enamel normal wires to B.S.S. 156/1953, Conymel types F, M.T. and X to B.S.S. 1844/1952.

The company state that unlimited numbers of these slides are available on request.

Errata

IN our feature relating to the Arora convector heater in our 29th October issue the price and model number were incorrectly stated. The 1 kW model is 441 and the total list price £10 1s. 6d. (£6 10s. plus £3 11s. 6d. purchase tax).

Also in the Trade Publications listed in that issue we referred to publications on lighting having been received from E. K. Cole, Ltd. This of course is incorrect. Ekco lighting is the responsibility of Ekco Ensign Electric, Ltd., 45 Essex Street, W.C.2.

TRADE PUBLICATIONS

HEATING.—"Thermovent" electric space heating is described in a new booklet showing heaters available from E. K. Cole Ltd., Southend-on-Sea.

CAPACITORS.—A. H. Hunt (Capacitors) Ltd., Bendon Valley, Garratt Lane, Wandsworth, S.W.18, have issued a new Service Trade Catalogue C.267.

SWITCHES AND ACCESSORIES.—New Switchcraft and Accessories Catalogues Nos. 340 and 341 together with a price slip for fixing in No. 300 motor control gear list have been issued by Midland Electric Manufacturing Co. Ltd., Tyseley, Birmingham.

CIRCUIT BREAKERS.—The Dorman and Smith miniature circuit breakers and the latest developments in this field are described in a brochure issued by the company from Ordsal Works, Manchester, 5.

MAINTENANCE.—"Keeping Electrical Plant in Action," is an appropriate title for a new booklet issued by Dynamo and Motor Repairs Ltd. It describes the firm's activities in this field.

LIGHTING.—Smart and Brown (Engineers), Spennymoor, Co. Durham, have issued three new leaflets dealing with their lighting fittings, lamps and "Maxilite" fittings.

BOILER EQUIPMENT.—A description of the Weir closed feed system is contained in a brochure just published by G. J. Weir Ltd., Cathcart, Glasgow, S.4.

WIRING ACCESSORIES.—A complete catalogue, W.190, illustrating "Wylex" electrical products is available from Geo. H. Scholes Ltd., Wylex Works, Wythenshawe, Manchester.

WATER TREATMENT.—"The Significance and Treatment of Cyanides in Industrial Waste Waters," by E. A. Whitlock, B.Sc., A.R.I.C., has been issued by Wallace and Tiernan Ltd., Power Road, W.4, in brochure form. The company are, of course, specialists in the provision of plant for this purpose.

RECORDING CONTROLS.—Sheet No. 311 describes a new three-term air operated controller designed to control automatically the supply of re-agents to fluids for ensuring accurately stable pH values or conductivity units in effluents which has been produced by the Cambridge Instrument Co. Ltd., 13 Grosvenor Place, London, S.W.1.

The WEEK in NEWS

ELECTRICAL EXPORTS ARE DECLINING

D. Maxwell Buist seeks Govt. Aid to Maintain 1952 Level

AS Britain's second largest exporter the electrical manufacturing industry fills a vital rôle in the national economy. There is, however, a downward trend in exports, yet the electrical industry has a smaller percentage drop than the other major exporters. Last year the electrical industry exported goods to a total value of nearly £220 million, but for 1953 the figure is likely to be about 5 or 6% lower. The decrease during the first six months was accounted for largely by items in the domestic field such as vacuum cleaners, cookers, washing machines and refrigerators, but turbines were up by £1·7 million for that period.

As a further indication of the trend, Mr. D. Maxwell Buist, export director of B.E.A.M.A., last week revealed that so far this year orders for only 70 MW of steam generating plant had been booked—compared with last year's exports of nearly 1,000 MW. Mr. Buist emphasised the necessity for government action to assist the industry in maintaining its position. Exports were now in the ratio of 60% of total output for home and 40% for export, which he considered the economic limit. To increase exports further it was necessary to expand sales at home, which were the foundation for the export trade.

He suggested that restrictions on capital investment should be lifted and purchase tax and hire purchase restrictions removed.

Abroad, it was a case of shrinking markets and increasing competition, and he expressed the view that the £140 million loaned so far by the World Bank on electrical development schemes was not enough. There was need for greater foresight in allocating finance to provide for industrialisation of overseas territories. As a further aid for manufacturers 13 Western European countries have agreed to a 3 month "armistice" in the provision of artificial incentives for exporters, with a view to their reduction or elimination.

Glasgow plans New Smokeless Zone

GLASGOW Corporation last week approved in principle the establishment of a smokeless zone in the centre of the city. A three-month survey is to be made of the changes involved in such a proposal, and the Health Committee will then consider whether the scheme should go forward. The area proposed is essentially a commercial and business district, and is thought to be capable of easier control that a zone where domestic chimneys predominate. The suggested zone would include Central Station which may present some difficulties to the proposals.

SCOTTISH ELECTRICITY BILL THIS SESSION

LEGISLATION to reorganise electricity supply in Scotland will be laid before Parliament during the present session. This was announced in the Queen's speech at the opening of the Session on Tuesday. Three other bills are of special interest to the electrical industry amongst the eighteen promised. The first of these will transfer atomic energy control from the Ministry of Supply to a statutory Corporation. Another is likely to have some effect on the electrical load curve. It is a bill to restrict night working in the baking industry. A Bill will be introduced conforming with the Government's proposals for commercial television development.

Enquiry into Copper

THE Monopolies and Restrictive Practices Commission is examining semi-manufactures of copper and copper-based alloys. Terms of reference include copper, brass, bronze and nickel silver in the common forms such as sheet, strip, wire, tubes, rods and sections. Statements from interested concerns will, of course, be welcomed.

The First Half-Century

The agreement between the National Electrical Contractors' Association and the National Electrical Manufacturers' Association, approved at Tuesday night's meeting, will probably come into operation on New Year's Day. The text is not yet ripe for publication, but it may be stated that members of the N.E.C.A. will buy only from members of the N.E.M.A., and by way of return will obtain preferential trade terms. Also the Manufacturers bind themselves not to give trade discounts to architects or consulting engineers. A similar arrangement is being negotiated with the Plant and Cable Makers' Association.—*From our issue of November 5, 1903.*

New Repair Rules follow Fatality

NEW rules governing procedure before repair work on distribution lines is begun have been enforced by the Southern Electricity Board, following a fatal accident at Oxford last August. A verdict of "death by misadventure" was recorded at last week's inquest on a linesman. It was stated that the dead man was working on a section of the l.t. system when he caught hold of a live wire. The system had been disconnected previously but a line from a separate transformer which vanished underground near some houses was overlooked. The Board will now see that engineers examine the plans before beginning work, and the men will be issued with shorting sticks for tests.

Wage Rise for N.I. Electrical Workers

MANUAL workers in the electricity supply industry in Northern Ireland are to get a 1d. an hour increase as from September 24. The unions had claimed 1½d. an hour, but the employers' offer of 1d. was accepted on the understanding that this is without prejudice to the union's claim for the additional ½d. per hour, which is being referred to arbitration. This was announced at a meeting of the Joint Industrial Council in Belfast last week.

OFFICIAL PUBLICATIONS

E.R.A. REPORTS. A/T136: Tracking in Solid Insulating Materials: Variables in the Test for Susceptibility to Tracking, by V. E. Yarsley, W. J. Grant and G. C. Ives, 24s. 5d.; G/T280: Flameproof Electrical Apparatus: Flanged Joints, One Inch in Radial Breadth, in Mixtures of Ethyl Ether Vapour and Air, by T. J. A. Brown and N. Simpson, 7s. 9d.; G/T284: Flameproof Electrical Apparatus: Flanged Joints, One Inch and One-Half-Inch in Radial Breadth, in Mixtures of the Vapour of Methyl Ethyl Ketone and Air, by T. J. A. Brown and N. Simpson, 10s. 9d.; L/T275: Dielectric Properties of Polytetrafluorethylene and Polychlortrifluorethylene, by J. V. L. Parry, 6s. 3d.; L/T281: Effects of Contamination on Structure and Properties, with Special Reference to Long-Chain Ketones, by V. Daniel and C. Turner, 6s. 3d.

BRITISH STANDARD. B.S. 2042: Artificial ear for the calibration of earphones of the internal type.

STATEMENT OF GUARANTEE by Treasury in respect of proposed loans by B.E.A. H.M.S.O. 2d.

B.E.A. Review

FIVE eventful years of supply industry progress are reviewed in the B.E.A.'s booklet "Giant Power," price 1s. Prepared for the general reader rather than the engineer, this publication reviews every aspect of the Authority's work, emphasising the natural growth of electricity.

View of the luxurious interior of Falco's new mobile showroom

U.K. FIRM FORMS SUBSIDIARY IN CHICAGO

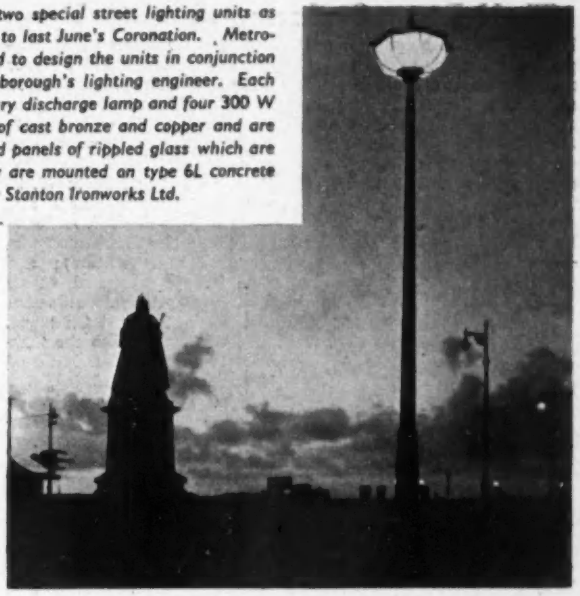
THE not so encouraging information concerning electrical exports given by Mr. D. Maxwell Buist is counteracted to some extent by the news that a company is setting out on an extensive campaign to sell British goods in America. The company is Brook Motors Ltd. who announce the formation of their American concern, Brook Motor Corporation of Chicago. Arrangements were finalised last month.

A stock of motors, all specially designed for the U.S. market will be held in America to an initial value of £150,000, and the first shipments are expected to leave shortly. It is confidently expected that an annual turnover of over $1 million will be built up within two years. Stocking and servicing agencies are being established in a number of states and an extensive advertising campaign is to start early in 1954.

Brook Motors have nine factories in Huddersfield and a new factory was recently completed at Barnsley.

New Cooker tours South and Midlands

THE "Royal" cooker, introduced by Falco Electrical Appliances, Ltd., last May, is embarking on a tour of the Eastern, Southern and Midland counties which will extend over the next six months. One of the cookers has been installed in a luxurious travelling showroom which will carry it to electricity showrooms of the Boards, subareas, and other dealers, and also to local authorities for inspection. A detailed programme has been prepared, and it is intended to visit all the main towns and cities in the area chosen. Displayed in the mobile showroom, with the cooker, will be many other electrical appliances made by the same company. Details of the Falco "Royal" were given in our May 28 issue.



Southport Corporation have erected two special street lighting units as a permanent and practical memorial to last June's Coronation. Metropolitan-Vickers Electrical were invited to design the units in conjunction with Mr. G. W. A. Illingworth, the borough's lighting engineer. Each lantern accommodates a 1 kW mercury discharge lamp and four 300 W metal filament lamps. Lanterns are of cast bronze and copper and are 5ft in diameter. Each has eight curved panels of rippled glass which are hinged to facilitate easy access. They are mounted on type 6L concrete columns manufactured by Stanton Ironworks Ltd.

B.S.I. Open Day at new Park St. Offices

THE 300 members of the staff of the British Standards Institution have now occupied their new premises in Park Street, W.1, for about two months. By way of celebration over 2,000 were invited to look over the new Institution last week, and most were as agreeably impressed with the transformation as were the staff. The verdict was one of increased convenience in all fields of activity.

At the Institution's annual meeting last Thursday, Sir Roger Duncalfe was elected President to succeed Viscount Waverley. Sir Roger is chairman of British Glues and Chemicals, Ltd. He was knighted for his great work on industrial standardisation.

Italians Claim Radio Power Transmission

POWER transmission by radio waves is claimed in a report from Italy which speaks of experiments under the auspices of the Ministry of Defence. No statement is available from official sources, but it appears that the Italian navy has been purchasing equipment and instruments for use in such experiments. The system, which is stated to handle far greater amounts of energy than previous similar electro-magnetic wave techniques, is reported to have been invented by Signor Guiseppe de Nitto, a former naval engineer officer who is now a captain in the Italian merchant navy. The experiments have been conducted in a fort on the Granarolo hills near Genoa, it is stated.

South West wants Early Tariff Relief

RECENT reports from the south-west indicate a popular belief that the revenue of heavily-populated and industrial area boards should be used to subsidise the S.W. Board in its efforts to develop electricity supplies in rural areas. The opinion is believed to be held by officials in the supply industry itself, besides those of various outside organisations. General agreement on the idea was expressed at last week's meeting of Exeter Chamber of Commerce, whose chairman stated that ten Electricity Boards were very much against giving assistance of this kind.

The District Manager of the Board pointed out that a committee had been formed to consider rural development and expenditure involved. He understood the chairman also favoured subvention.

Similar opinions were also voiced recently at Taunton's town council meeting. There was severe criticism of charges and administrative costs, and also the further imposition of line rentals on rural dwellers. It was urged that part of the B.E.A. surplus should be used to bring relief to the area, but an amendment that the principle of subvention be excluded from the motion was successful. Action more effective and proper than subsidies was said to be cuts in administrative costs. Mr. S. H. Payne, a member of the Board, said the question of subvention had been dealt with by the Minister and by the Central Authority, the former stating he was in favour of giving the area some assistance.

WORK STUDY

A SPECIAL three-day appreciation course on Work Study for Personnel Officers is being organised by the Institute of Personnel Management, the Institution of Production Engineers and the College of Aeronautics at Cranfield. It will take place at the College between November 27 and 29. The course will outline the principles and practices of Work Study but will not make personnel officers efficient as work study technicians.

World Power Conference Plans for 1954

ELEVEN British papers are planned for presentation at next year's sectional meeting of the World Power Conference, to be held at Rio de Janiero from July 25 to August 8. The authors and their subjects include Messrs. J. D. Peattie (Integration of Hydro and Thermal Electric Power in Great Britain); E. W. Golding (Economic Aspects of Utilisation and Design of Wind Power Plants); Sir Harold Roxbee Cox (Introduction to British Developments in Gas Turbines); Messrs. A. T. Bowden and R. J. Welsh (Gas Turbines for Use on Land and Sea); W. F. Simonson (Boiler Design and Availability); Prof. O. A. Saunders (Possible Thermal Cycles for Power Generation); and Mr. H. Astbury and others (Design of Electrical Equipment for Use in Tropical Climates).

In connection with the Conference, the Brazilian National Committee of W.P.C. is organising a tour to see hydro-electric and thermal power stations and petroleum plants.

Photo-Electric Alarms Cover Bigger Areas

A DEVELOPMENT of the burglar alarm system involving the interruption of a light ray falling on a photo-cell, now enables the principle to be applied to the protection of larger premises and establishments such as factories, army camps and aerodromes. Hitherto, this method of giving an alarm has been limited by distance of projection, but the light ray can now be projected over 1,000 yards when white light is used or over 500 yds with infra red light. Equipment making this possible has been developed by the General Electric Co. Following closely on this achievement, we hear an order has been placed involving the protection of the 12-mile perimeter of a secret site in the Commonwealth. Infra-red light is being used in this instance.

Naval Replanning to House New Apparatus

SOME of the difficulties which faced the Admiralty when ordering new ships, were referred to in an interesting speech by Capt. R. B. Shorto, D.S.C., R.N., at the Batti-Wallahs' luncheon last week. He instanced the ordering of aircraft carriers which within a few years of completion had virtually to be replanned to accommodate both the heavier aircraft utilised and the electronic equipment nowadays installed. At the next luncheon, on November 25, the chief guest will be Commander Peter Scott. Ladies' night has been fixed for March 17, 1954.

E.A.W. ACTIVITIES

"How it Works"

ANOTHER informative chart has been compiled and produced by E.A.W. as an addition to the "How it Works" series. It is No. 7b and deals with the electric suction cleaner. The cylinder type cleaner is illustrated and the chart shows the relative positions of the dust bag, fan and commutator, electrical connections, and precautions necessary to prevent dust getting to the motor. Produced in four colours, linen backed and varnished, and cots 5s.

New Scottish Branch

RAPID expansion of the E.A.W. continues with the formation of yet another local branch at Stirling in Scotland. The inaugural meeting took place on October 19, and was given a flying start after representatives had returned from the bi-annual Scottish Branch Officers' Conference the previous day.

Silver Jubilee

THE Association's N. Wales branch recently celebrated its silver jubilee, and became the eighth to reach that status. At the dinner, to mark the occasion, the toast of "Wrexham" was proposed by Sir Vincent de Ferranti, and the reply was given by the Mayor. Toast of the Association and the branch was proposed by Mr. J. Eccles, chairman of the Merseyside Board, and Dame Caroline Haslett replied.

Diploma Awards

THE E.A.W. Diploma in Electrical Housecraft — endorsed for Cookery Demonstration, Laundry Demonstration, and Salesmanship — has been awarded to 15 new candidates. This brings the total number of diploma holders to 452. One candidate gained a distinction in salesmanship, two in cookery, and one in both cookery and laundry.

This impressive shot was taken at the Witton works of G.E.C. It shows a winder at work on stator of a 25 MW vertical shaft alternator for the Tungatinah hydro-electricpower station, Tasmania. The company is supplying five alternators, each weighing 175 tons complete, for installation at this power station

"Reading in bed is a good idea when Osram makes the print quite clear," is the caption to this little bedroom scene depicted by the G.E.C. in a window display at their London headquarters

Conference on Exports at Buxton

DELEGATES to the F.B.I.'s Export Sales Conference held at Buxton last week-end were promised practical suggestions based on actual experience on the problems involved and methods to adopt in tackling overseas markets. Much sound information was immediately forthcoming in the opening session by Sir William Rootes, chairman of the Dollar Exports Council.

Sir William spoke of three factors vital to success. The tempo of production had to be adjusted—which may involve greater mechanisation—in order to become more competitive. More forethought was required in adapting goods to consumer requirements, especially as regards packaging and styling. Thirdly, greater initiative in advertising, market research and the like was necessary. He then listed ten commandments for the British industrialist. The first four were interlinked. They involved a broader policy for science and research, the enlistment of more pupils and apprentices and better factory and technical training; all of which would ensure we were first in the field with new developments. The remainder concerned the sales side. Sir William advocated the sharing of commercial intelligence between groups in industry, and suggested that market research could well be done by associations and societies and made available to all. He had a word also for choice of agents, the small details (such as speedy and clear replies to enquiries), the proper method of advertising, and the best exploitation of exhibitions.

Another talk was given by Sir Harry Pilkington. There were a number of interesting discussion groups.

DIAMOND JUBILEE

WAY back in 1893 when foreign lamps were pouring into this country it was a brave firm which dared to open a lamp works at Hammersmith. The firm concerned was Robertson Electric Lamps Ltd., and the Brook Green factory established then became the first of eight General Electric Co. lamp works scattered throughout the country. The story leading up to this diamond jubilee is really a history of electric lamps in Britain. In marked contrast to the small beginning, over 9,000 employees at the G.E.C.'s lamp factories are celebrating the jubilee.

Coming of Age

CONGRATULATIONS are due this week to R. B. Pullin and Co. Ltd. of Brentford, who last Sunday celebrated their 21st birthday. An admirable history of the company as well as a detailed summary of their activities at the present day is contained in a most attractive brochure, leather covered and spiral bound. Having reached the final page, after scanning photographs of the works and many of the people, the reader feels he knows everything and everyone connected with the company.

Welding and Heating Interests Change Hands

AS from last Monday the Metropolitan-Vickers Electrical Co. Ltd. have taken over the manufacture, sale and servicing of resistance welding and heating machines formerly made by British Insulated Callender's Cables. Arrangements made by the two companies were announced last week-end. This will, of course, add considerably to the already large range of arc welding and resistance welding equipments marketed by Metrovick.

This display is now being featured in the windows of a number of Electricity Board's service centres. It shows Thermat electric blankets and pads made by H. J. Baldwin and Co., Ltd., of Nottingham

Motor Show Dinner

ONCE again this year during the "Motor Show" Oldham and Son, Ltd. entertained their friends to a dinner and cabaret at the Park Lane hotel. Proposing "The Guests," Mr. J. Oldham, chairman and joint managing director, surveyed a wide field of subjects, including advertising, salesmanship, politics and technical details. Mr. A. Twidle, chief automobile engineer of the B.E.T. Federation, Ltd., and Mr. E. N. Hiskins, managing director of the Midland Auto Electrical Co. (Lichfield), Ltd., replied.

TOMATO GROWING

THE article on "Electricity's Aid to Tomato Growing" on Page 801 of last week's issue of the ELECTRICAL TIMES was written by Mr. E. C. CLAYDON, not Clayton as printed.

NEWS IN BRIEF

The Ideal Home Exhibition of 1954 will be held at Olympia, London, between March 2 and 27.

Engineers' Guild are holding a recruitment meeting at Caxton Hall, Westminster, next Thursday, beginning at 6 p.m.

Royal Institute of British Architects have approved the award of their bronze medal to Cecil Howitt and Partners, Nottingham, for the best building completed during the last three years in Nottinghamshire, Lincolnshire and Derbyshire. The award is in respect of the B.E.A.'s power station at Staythorpe.

A memorandum "Estate Duty and the Family Business" has been published in booklet form by the F.B.I. The memorandum has been submitted to the Chancellor of the Exchequer.

H.M. the Queen has informed the Radio Industry Council that she is pleased to be patron of the National Radio and Television Exhibition in 1954. The Radio Show will be held at Earl's Court, London, from August 25 to September 4.

Consignment of nearly 1,000 nickel cadmium alkaline battery cells and associated equipment is to be shipped by Nife Batteries to the Far East shortly for the Nangal Grid scheme—part of India's electrification programme. They were ordered by the main contractors, English Electric Co. Ltd.

An exhibition of silicone rubber is to be staged by Midland Silicones Ltd. at 19 Upper Brook St., W.1, between December 2 and 10.

Questions in Parliament . . .

Fuel Advisory Service

At the time of the announcement of the new Fuel Efficiency Advisory Co., Mr. Joynson-Hicks gave some details of staffing of the Ministry's service in answer to Mr. Palmer. He said 150 technical staff were employed by the Ministry, and of those, 94 were in professional fuel engineering grades. The new company would select its own staff but help would be given to those employed on the task at present.

Legislation for Scotland

Questioned by Mr. Palmer on possible new electricity supply legislation for Scotland, mentioned in the Queen's Speech last November, the Secretary of State for Scotland said he had nothing to add at this stage. He suggested members await the next Gracious Speech.

Monopolies Commission

President of the Board of Trade was asked whether the supply of electrical equipment to motor cars would be referred to the Monopolies and Restrictive Practices Commission. He said the matter would be borne in mind. It was hoped to announce at least one new reference shortly.

Purchase Tax Changes

Following the request made by traders that any changes in purchase tax will be arranged to operate as from January instead of Budget time, Mr. Porter asked for a statement from the Chancellor of the Exchequer. Mr. Butler said he had received the representations and was certainly bearing them carefully in mind in coming to a decision.

Nuclear Power

A short statement on scientific advances made towards the use of atomic energy for industrial, domestic, transport and other purposes, was made in a written answer to Mr. H. Hughes last week. Design studies on a nuclear power station using natural uranium as a fuel had been completed, and an experimental power station was being built in Cumberland. In addition a low power breeder reactor was nearing completion at Harwell. It was also stated that design studies were in progress on a higher powered reactor of the same type, and also on other types which might be suitable for development of power. Application of radioactive isotopes continued to expand, and plans were being formed to increase production.

Saving Fuel

Minister of Fuel and Power was asked by Brig. Medlicott if he had considered the British Productivity Council's report which emphasised a campaign for saving fuel. Minister said the Council's technical recommendations were primarily for action by industrial consumers and by the new Fuel Efficiency Co. On wider issues, the Minister stated, the Government's policy was guided by the Ridley Committee's preference for consumer freedom and competition between industries rather than on authoritarian control.

On the subject of loans for installing

fuel-saving plant, Mr. Lloyd said 79 applications had been made. Of that number seven had been approved involving some £84,000; 37 (totalling about £190,000) were still under consideration; and the remainder had either been withdrawn or rejected.

Electricity in Lanarkshire

Mr. J. Stuart stated in a written answer last week that 144 farms in Lanarkshire had been connected during the six months ending last September. Corresponding figures for the previous four years were 85 farms in 1952, 43 in 1951, 41 in 1950 and 14 in 1949. He was replying to Mr. Patrick Maitland.

Radio and TV Interference

A request to lay down specifications as a condition of granting licences in view of radio interference caused by industrial, scientific and medical apparatus, was made by Capt. Orr. Mr. D. Gammans said that type of equipment did not require a licence from the Postmaster-General, but he was authorised to legislate to reduce interference after consultation with technical committees provided. Regulations had been made concerning combustion engines and other committees were studying the problems of small electric motors and refrigerators. Those were the major causes of trouble, he said. He warned that interference raised many problems and it might be years before they were solved.

International Radio Conference

Mr. D. Gammans told the House last week that he would make available the reports of this year's conference of the International Consultative Committee (Radio). Among matters considered were the formulation of common standards and practices, and making the best use of the radio frequency spectrum.

TV Station on Isle of Wight

A temporary low-power television station was to be erected on the Isle of Wight and should be working by the end of 1954, Mr. D. Gammans stated. It was not known when a permanent station would be in operation for the area.

Wire and Cable Costs

In the course of a reply last week, Mr. D. Gammans said the cost of telephone wire had fallen by about 11% in the past year. Such an average was more difficult to calculate in respect of cable but for some commonly used types of cable the comparable decrease was 14%.

Blinking Beacons

The Minister of Transport refused to consider alternative methods of lighting zebra crossings and said the present blinking lights had proved the most satisfactory of all experiments carried out. He had been asked if he was aware of the distraction and consequent danger which the present lights caused. Answering a further question he said he would be making blinking beacons compulsory as soon as all local authorities had sufficient time to install the mechanism.

Sodium Lighting

Comparative cost between sodium and other types of street lighting was queried in the House last week. Mr. Lennox-Boyd said sodium lighting usually cost between £3,000 and £4,000 per mile to install and averaged about £650 p.a. per mile for maintenance. It was generally cheaper than other forms. He refused to dogmatise or recommend it specifically to local authorities.

Tax on Heaters

Mr. Chetwynd asked last Thursday whether electric tubular heaters used in churches and Sunday schools could be exempted from purchase tax. He was told that since the inception of purchase tax it had been a principle that articles could not be exempted because of a special use to which they might be put.

Orders for Electronic Equipment

In a written answer last week it was stated that the Ministry of Supply had placed orders for electronics equipment to the value of £50 million during 1952-53.

Smokeless Fuels

A question was asked by Mr. P. Freeman on the conversion of coal into smokeless and gaseous fuels to avoid pollution. Mr. G. Lloyd said that since 1946 consumption of coal for electricity generation rose by 35·6% and tonnage of coal carbonised by 24·4%. Included in the last figure was an increase of 22% in tonnage carbonised by the gas industry, which was the principal supplier for the general domestic and industrial market. Increase in the availability of smokeless fuels produced from coal in the electricity supply industry was from 41,498 million kWh in 1946 to 62,056 million kWh in 1952, or 49·5%. This compared with an increase of 23·6% in the gas industry.

Building New Factories

Concern was expressed recently about the number of Government Departments whose approval had to be obtained before a new factory could be built, or an existing one extended. The President of the Board of Trade was asked if the number could be reduced. He replied that improvements to the procedure were always being sought as well as simplification in the administration of remaining controls.

Answering a similar question a day or two later, Mr. Strauss said further simplification of licensing procedure was being considered and an announcement would be made before December 31.

Electricity on Housing Estates

Answering a question on cooking and washing facilities provided (or not provided) by councils on new housing estates, Mr. H. Macmillan said some local authorities preferred to give tenants freedom of choice and consequently did not provide these facilities. He said points for either gas or electricity were always installed, and either type of appliance could be fitted, but he could not dictate to local authorities.

Electric Supply News . . .

Belfast

The Corporation Electricity Committee has asked the city electrical engineer and manager, Mr. R. P. Watson, to prepare a report on the organisation of his department, together with recommendations for reorganisation.

Eire

The Electricity Supply Board is inviting tenders for the civil construction work of its River Clady (Co. Donegal) hydro-electric scheme. This provides for a 500 ft long and 25 ft high weir dam in the Gweedore area. The major part of the water storage thus increased will be diverted through a head race, along a canal 1¼ miles long and 95 ft wide, to a small fore bay. It will then fall through a 1,600 ft long penstock pipe to drive the 4,000 kW turbine.

Londonderry

The question of assessing rooms for the purpose of electricity tariffs was the cause of protests at the recent meeting of Londonderry Corporation. It seems that the Electricity Department had assessed apartments in houses at Creggan estate as kitchens, whereas the tenants claimed they were sculleries. A special sub-committee had recommended that the tenants should be given the option of agreeing to the new charge or taking power under an alternative tariff. The mayor pointed out that the Council had already agreed to charge for kitchens. There were thousands of houses in Londonderry without sculleries. If kitchens were deleted from the lists it would probably be necessary to raise the charges.

Monmouthshire

At a meeting in private the Magor and St. Mellons Rural Council recently rescinded an earlier decision and agreed to offer no opposition to the B.E.A.'s proposal to erect a new power station at Rogerstone.

LIGHTING SCHEMES

Birkenhead.—T.C. is recommended to approve street lighting schemes for 1953-54, estimated to cost £23,588.

Chester.—T.C. is making application to the M.O.T. for consent to install lighting on various roads, to a total estimated cost of £5,415.

Wandsworth.—The B.C. propose to install sodium lighting along Trinity Road, Upper Tooting, Tooting Bec Road, Wandsworth Road, East Hill, Wandsworth High Street and Upper Richmond Road, at a cost of £47,594.

Company Activities . . .

British Electrical Resistance Co.

The net profit for the year ended July 31 last is £14,056, compared with £11,497 for the previous twelve months. With a final dividend of 15% plus an additional 5%, the total distribution for the year is again 25%.

British Electric Transformer Co. Ltd.

For the year ended June 30 last the net profit, after all charges, is £59,360, as against £34,059 for the previous year. There is to be a dividend of 3s. per share on the 5s. Ordinary shares. For the previous year the dividend was 1s .10d. per share.

Crabtree Electrical Industries

Although the trading profit for the year ended July 31 last dropped to £247,519—some £116,060 lower than for the previous year—the total distribution is maintained at 17½% with a final dividend of 10%. After charging taxation, depreciation, etc., the net profit amounts to £65,601 (*£113,065*).

Crompton Parkinson Ltd.

The consolidated net income for the year ended June 30 last is £2,058,871, compared with £1,690,937 for the previous period. These figures are struck after allowing all charges except taxation, transfer to specific reserves and employees' bonus. After allowing those items the net profit becomes £662,713 as against £397,934 for the preceding period. The directors consider that the much improved results justify a substantial increase in the distribution to stockholders, and are accordingly paying a final dividend and special cash bonus each of 7½%. For the previous year both the final dividend and the cash bonus were 3¾% each.

Holophane Ltd.

This company's business in the past year reached almost the same level as in the previous period, but further difficulties in the position of supplies of materials retarded progress, the directors report. While efforts were made to stabilise the prices of products further increase in the cost of materials and of operating expenses resulted in a reduction in the trading profit.

Year to Jun.30	£ Trading Profit	£ Net Profit	% on Ord. Earn'd	% on Ord. Paid	Ord. Price High	Ord. Price Low
1949	71,211	29,892	54	15	10/9	8/3
1950	90,655	41,457	75	15	13/-	9/6
1951	89,809	38,461	73	15*	10/6	7/6
1952	143,230	53,034	66	20	11/9	7/6
1953	126,193	46,915	57	20	13/3	11/1

* Plus 50% capital bonus.

Longmore Brothers

This firm of conduit manufacturers, etc., reports a net profit of £37,036 for the year ended August 4 last, after charging taxation. The corresponding total for the previous year was £38,420. The dividend is again 15%.

Morphy-Richards Ltd.

The slight overall expansion in business is reflected in the increased trading profit for the year ended June 30 last. Although exports to Australia were much lower than previously, this reduction was considerably offset in other

Year to June30	£ Trading Profit	£ Net Profit†	% on Ord. Earn'd	% on Ord. Paid	Ord. Price High	Ord. Price Low
1949	110,512	39,611	262	160	16/-	12/6
1950	138,136	33,245	55	40*	15/9	14/-
1951	245,649	79,163	136	40	19/-	13/9
1952	180,677	41,083	61	40	14/7	12/7
1953	197,985	52,007	72	40	15/10	13/-

† Available for parent company.
* Plus 300% capital bonus.

markets, particularly in Canada. Total exports were in excess of £500,000. In the first quarter of the current year, exports show an increase of £40,000 over the corresponding period of the previous year, Mr. G. Wansbrough, the chairman states.

Herbert Morris Ltd.

An increase of 5%, tax free, on the dividend, making 30% for the year ended July 31 last, is announced. The group trading profit is £873,127 after charging depreciation, compared with £620,227 for the previous year.

J. & F. Stone Lighting and Radio

Now in its 25th year, this concern, which operates 150 branch shops in London and the Provinces, reports a record trading profit for the year ended June 30 last. Mr. D. G. Niarn, the chairman, attributes this to some extent to the additional demand for television sets to view the Coronation, and to the stimulus given to sales by the reduction in purchase tax on various items. The company, by the way, finances its own h.p. transactions; collections under such agreements were again very heavy. Referring to the increase of £100,000 to £305,232 in the net book value of group fixed assets, he states that this represents

Year to June30	£ Trading Profit	£ Net Profit	% on Ord. Earn'd	% on Ord. Paid	Ord. Price High	Ord. Price Low
1949	380,065	137,558	53	40	18/1	10/7
1950	412,077	148,389	62	40	20/3	14/10
1951	515,054	170,420	75	40	18/10	14/-
1952	570,233	168,996	75	40	16/10	11/6
1953	761,900	183,014	82	50*	25/1	14/4

* Including bonus 10%.

substantially the cost price of acquiring the freehold interest in properties leased to the company. Since July 1 last, turnover has been more than maintained. The demand for t.v. sets is as great as ever, and that for domestic appliances continues to increase.

Strand Electric Holdings Ltd.

The reduction in profit from last year's record figure is the result of a fall in both turnover and the rate of profit, Mr. J. D. H. Sheridan, the chairman, reports. But the results of the Hire

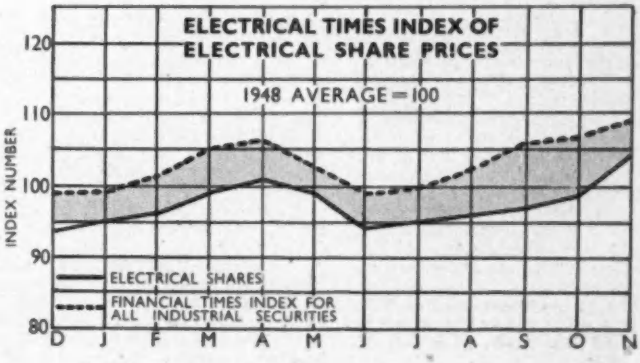
Year to Apr.30	£ Trading Profit	£ Net Profit	% on Ord. Earn'd	% on Ord. Paid	Ord. Price High	Ord. Price Low
1951	275,140	22,214	37	17½	10/3	8/2
1952	294,965	22,927	38	17½	9/-	7/6
1953	268,546	17,291	27	17½	10/-	7/9

Department for the first few months of the current year show an upward tendency, and the Sign and Contracting Department also reports improvements in profits. The results of Implitico Ltd. were very much better than that of the previous year.

Dividends Declared

Bakelite Ltd.—Interim Ordinary of 3% (*same*).
W. Canning and Co.—Interim of 10% (*same*).
Desoutter Bros. (Holdings).—Interim of 7½% (*nil*).
Garrard Engineering and Manufacturing Co.—Interim of 10% (*same*).
J. Stone and Co. (Holdings) Ltd.—Interim of 5% on Ordinary, and 5% tax free on 'A' Ordinary stock.

Share price indices rose considerably during October, the upward trend continuing but at a steeper rate. Both indices are now well above the 1948 *base level of* 100. *Most marked increase was shown by the Electrical Times index for all electrical shares which rose from* 99·1 *to* 104·6. *Over the same period the Financial Times index for all industrial shares rose by* 2·5 *to* 109·1



Commercial Information

CONTRACTS OPEN

HOME

Dates given are the final for receipt of tenders, unless otherwise stated

6 Nov.—Belfast T.C. Water screening plant.—Advertised in Sept. 24 issue.

6 Nov.—N. Ireland. Applications for installation at Central Chest Clinic, Belfast.—See Oct. 22 issue.

7 Nov.—Ballinasloe (Eire). Installation at Mental Hospital.—See Oct. 22 issue.

7 Nov.—Ipswich T.C. Street lighting.—Advertised in Oct. 22 issue.

7 Nov.—Manchester T.C. Installation in police houses.—See Oct. 29 issue.

7 Nov.—Peterborough Installations in dwellings on Dogsthorpe North estate. Applications by above date.—Advertised in Oct. 29 issue.

7 Nov.—Windsor T.C. Electric supplies during 1950. See Oct. 8 issue.

9 Nov.—Blackburn T.C. Electrical installation in stage 1 of Technical College in Nab Lane. Names by above date to Willink and Dod, Cunard Building, Liverpool.

9 Nov.—Durham. Installations in nine schools. Applications by above date.—See Oct. 29 issue.

9 Nov.—Hastings T.C. Installation in St. Leonards school. Names by above date.—Advertised in Oct. 29 issue.

9 Nov.—Royston U.D.C. Street lighting.—See Oct. 22 issue.

9 Nov.—St. Faith's and Aylsham (Norf.) R.D.C. Wiring houses at Horstead and Salhouse.—See Oct. 29 issue.

9 Nov.—Wrexham T.C. Electrical installation in 340 dwellings on various sites. Borough Engineer and Surveyor, 31 Chester St. Deposit £2 2s.

10 Nov.—Fermanagh. Installation at Kesh school.—See Oct. 29 issue.

10 Nov.—Monmouthshire T.C. Installation in houses on Rockfield Rd. estate.—See Oct. 29 issue.

12 Nov.—Bournemouth T.C. Installation for Kinson sewage works.—See Oct. 29 issue.

12 Nov.—Feltham U.D.C. Wiring of 311 dwellings on Poors Land estate. Engineer and Surveyor, Lynton House, Hanworth Rd. Deposit £2.

12 Nov.—Northwich (Chesh.) R.D.C. Pumping plant.—See Oct. 22 issue.

13 Nov.—Downpatrick R.D.C. Electrical installation in council offices, Quoile Rd. R. J. Carr, clerk, Council Offices.

13 Nov.—Durham. Electrical installation in civil defence control centres at Jarrow, Hebburn, Felling and Billingham, an aged persons' hostel at Jarrow and an ambulance headquarters in Durham.—Applications by above date to County Architect, Court Lane.

13 Nov.—Sheffield T.C. Installation at King Edward VII school.—See Oct. 29 issue.

14 Nov.—Macclesfield T.C. Street lighting.—Advertised in Oct. 29 issue.

14 Nov.—Newcastle-on-Tyne T.C. Applications invited to be included on list of contractors for electrical work and heating installations up to value of £1,000. Names by above date to City Estate and Property Surveyor, Town Hall.

14 Nov.—Preston T.C. Equipment for Larches Hostel.—See Oct. 29 issue.

14 Nov.—Rochester T.C. Street lighting.—See Oct. 29 issue.

16 Nov.—Bradford. Lamps during 1954 for Royal Infirmary.—See Oct. 29 issue.

16 Nov.—N. Ireland. Electrical installation in 157 dwellings at Andesontown. N. Ireland Housing Trust, 12 Hope St., Belfast. Deposit 10s.

16 Nov.—Peterborough T.C. Provision and erection of 14 group B lanterns on existing wooden poles along Westwood Farm Rd. City Engineer, Town Hall. Deposit £2 2s.

16 Nov.—Wrexham T.C. Supply only of group A and B columns, brackets, lanterns for street lighting. Borough Engineer and Surveyor, 31 Chester St. Deposit £2 2s.—Advertised in this issue.

17 Nov.—Docking (Norf.) R.D.C. Wiring in erection of 12 dwellings each at E. Rudham and Bircham, eight at Snettisham and two at Heacham. G. E. Gibson, Council Offices, Docking, King's Lynn.

18 Nov.—Clitheroe T.C. Supply and erection of h.p. mercury vapour lighting units along about 1,220 yd. of trunk road A59. Borough Engineer, Church St. Deposit £2 2s.

18 Nov.—Newcastle-on-Tyne T.C. Electrical and heating installation in 81 houses on Kenton North estate. City Architect, 18 Cloth Market.

18 Nov.—Wem (Salop) R.D.C. Installation in houses.—See Oct. 22 issue.

20 Nov.—Dublin. Gt. Northern Railways require supplies from Jan. 1 of electric fittings, train lighting cell parts, batteries and fittings for road vehicles, lamps, wire cable, etc. F. C. Wallace, secretary, Amiens St. station. Fee 1s.

20 Nov.—Belfast T.C. Transformers for Power Station West.—Advertised in Oct. 15 issue.

20 Nov.—Belfast T.C. 33 kV, 6·6 kV and auxiliary cables, etc., at sub-stations.—Advertised in Oct. 8 issue.

20 Nov.—Co. Kildare. Pumping plant in Ballytore water scheme.—See Oct. 8 issue.

20 Nov.—Londonderry. Installation at Ballyrashane school.—See Oct. 22 issue.

23 Nov.—Blofield and Flegg (Norf.) R.D.C. Vertical spindle borehole type pumps.—See Oct. 15 issue.

23 Nov.—Wisbech T.C. Street lighting.—See Oct. 29 issue.

25 Nov.—Clutton R.D.C. Electrical installation in 10 houses at Hinton Blewett. Thomas and Morgan and Partners, architects, 23 Gelliwastad Rd., Pontypridd. Deposit £1 1s.

25 Nov.—Dublin. Electrical installation in additional accommodation at Portrane Mental Hospital. Kenny and Partners, Consulting Engineers, 44 Kildare St. Deposit £10 10s.

27 Nov.—[illegible]. Ireland. Lighting and power installation in operating theatre at Whiteabbey Hospital, Co. Antrim. Apply to Wm. Harvey, secretary of N.I. Tuberculosis Authority, 27 Adelaide St., Belfast. Deposit £5 5s.

30 Nov.—Bournemouth T.C. Supply of electrical equipment for sub-stations. General Manager, Corpn. Transport Services, 99-101 Southcote Rd. —Advertised in this issue.

30 Nov.—Tottenham B.C. Supply of lamps during 1954-55.—See Oct. 15 issue.

4 Dec.—Belfast T.C. Overhead electric crane, switchgear, circuit-breakers, isolators and connection.—Advertised in Oct. 15 issue.

4 Dec.—Belfast T.C. Fire-fighting equipment for Power Station West.—Advertised in Oct. 29 issue.

11 Dec.—Belfast T.C. Boiler units for Power Station West.—Advertised in Oct. 1 issue.

11 Dec.—Belfast T.C. Exhaust piping with valves and electrical controls for Power Station West. —Advertised in Oct. 15 issue.

18 Dec.—Belfast T.C. Turbo-alternators, feed heating and condensing plants sets, generator transformers, and circulating water pumps for Power Station West.—Advertised in Oct. 15 issue.

18 Dec.—Belfast T.C. Supply, installation and maintenance of 110 kV oil pressure or gas type, and 33 kV main cables, auxiliary cables and accessories. (Tender No. 1235). Merz and McLellan, consulting engineers, Carliol House, Newcastle-on-Tyne. Deposit £5 5s.—Advertised in this issue.

4 Jan.—Lancaster T.C. Supply and installation of electrically driven centrifugal pumping plants for Lune St., Scale Hall, and Willow Lane pumping stations. City Engineer, Town Hall. Deposit £2 2s.

OVERSEAS

*Details of items marked * may be obtained on application to the Board of Trade, Lacon House, Theobalds Road, W.C.1, quoting reference.*

1 Dec.—New Zealand. Supply of one 10,000 kVA 110/22 kV transformer bank and spare unit for Edgecumbe sub-station. Contract No. 245. State Hydro-Electric Dept., Wellington. Documents available from N.Z. Govt. Offices in London.

2 Dec.—Egypt. Supply of 145 km l.t. cables, paper insulated, oil impregnated, lead sheathed and double armoured for laying direct in soil, 660 V, various sizes. Documents from Chief Inspecting Engineer, Egyptian Govt., 41 Tothill St., London, S.W.1, quoting ref.: 30/Elec. and Gas 3/2/574. Deposit £2 1s. —Advertised in Oct. 29 issue.

7 Dec.—Bolivia. Cochabamba Light and Power Co. S.A., P.O. Box 89, Cochabamba, invite tenders for supply of diesel motors coupled to synchronous alternators, with switchboard panels, outlet transformers, alarm protection systems, etc. B.o.T. (Ref. ESB. 4750/53).*

7 Dec.—India. Supply of eleven 1,500 kVA and six 3,000 kVA 3-phase 50 c/s transformers and thirty 11 kV indoor type trucks in Ganga Grid. Deposit Rs20s. Supt. Engineer, Hydel (Ganga) Circle, U.P. Roorkee.

13 Jan.—Australia. State Electricity Commission of Queensland invites tenders (spec. No. 404) for 4,250 ft 11 kV cable, 13,200 ft 660 V cable, and 12,000 yds 250 V control cable. Commission at Scottish Union House, Eagle St., Brisbane. Deposit 10s. 6d. B.o.T. (Ref.: ESB 7241/53)*.

14 Jan.—India. Supply and erection of (a) 34 spillway radial gates with mechanism and electrical equipment, and (b) an electrically operated elevator. Documents from Director General, India Store Dept., 32-44 Edgware Rd., London, W.2, quoting ref. S.3120/53. Deposit £4 2s. 6d. per copy.

17 Dec.—India. Supply of ammeters and h.t. instrument transformers. Controller of Stores, Electric House, Fort, Bombay. Deposit Rs5s.

9 Feb.—New Zealand. Supply of a single-phase, double wound transformer unit, 5 MVA, 110/28·9 kV 50 c/s, outdoor type, oil immersed and natural cooled. Contract No. 249. State Hydro-Electric Dept., Wellington. B.o.T. (Ref.: ESB 7350/53).*

CONTRACTS PLACED

Barrow-in-Furness T.C. Electrical installation in 119 houses on Tummerhill estate, N.W. Electricity Board, £3,821.

B.E.A. Cladding for turbine, switch, boiler and precipitator houses and coaling tower at Hackney B, J. L. Keir and Co., Ltd.; four 180,000 lb/hr boilers at E. Yelland, John Thompson Water Tube Boilers, Ltd.; two 300,000 lb/hr boilers at Portishead B, Mitchell Engineering, Ltd.; one 300,000 lb/hr boiler at Goldington, Clarke Chapman and Co., Ltd.; two 830,000 lb/hr boilers at Willington A, International Combustion, Ltd.; and two 100,000 kW turbo-generators, condensing and feed heating plant, one 120 MVA

Your Queries — Answered

Sign comprised of letters which can be clipped over a fluorescent tube, suppliers of? C.W.—Brown Bros. Ltd., Gt. Eastern St., E.C.2. (24408)

"Portman" fires, makers of? N.W.—H.M.V. Household Appliances, Blyth Rd., Hayes. (24425)

Wringer independently driven, makers of? J.B.—Acme Wringers Ltd., 97 David St., Glasgow, S.E. (24437)

"Surrey" transformers, makers of? L.B.—These were made by A. E. Powell Ltd., of 118 Sheen Rd., Richmond, a firm which went out of business about 6 years ago. There are no manufacturers' spares available. (24450)

"Rulag" batteries, makers of? L.B.—Falk Stadelmann and Co. Ltd., 91 Farringdon Rd., E.C.1. (24463)

"Matelux" fittings, suppliers of? E.C.—J. M. Wotherspoon and Co. Ltd., 194 Bishopsgate, E.C.2. (24471)

"Forrest" type testers, makers of? T.E.—Ferranti Ltd., Hollinwood, Lancs. (24487)

"Seco" syrens, makers of? S.E.—Service Electric Co. Ltd., Honeypot Lane, Stanmore, Middx. (24496)

The above are selected from questions we have answered this week. If you have a query, send it to us.

generator transformer and two 15 MVA transformers at same, English Electric Co., Ltd.; high pressure piping equipment at Meaford B, Babcock and Wilcox, Ltd.; ash and dust handling plant for No. 1 boiler at Ferrybridge B, B.V.C. Industrial Constructions, Ltd.; high pressure pipework and valves at Portobello, Aiton and Co., Ltd.; four 150,000 lb/hr boilers at Barony, Babcock and Wilcox, Ltd.; and 132 kV double circuit o.h. line at Dudley, British Insulated Callender's Construction Co., Ltd.

PRICE OF CABLE METALS AND OTHER MATERIALS
(Official close at Tuesday, November 3)

	£ per ton	Weekly change
COPPER, standard class A	237½-242½	—2½/0
(3 months)	223½-224	—1½/2
LEAD, refined pig, mim. 99·97% purity	95½-95¾	—1/1
(3 months)	90-90½	—½/½
TIN, refined, min. 99·75% purity	615-617½	—12/12½
(3 months)	605-607½	—1/½
ALUMINIUM, ingots 99·99·5%	150	—
ZINC, virgin, min. 98% purity	75½-76	½/0
(3 months)	74-74½	+1¼/1½
RUBBER No. 1, RSS. spot (per lb.)	16d.-16½d.	—½/½
(3 months) (per lb.)	16d.-16½d.	—½/½
ARMOURING:		
Galv. Steel Wire (0·104 in.)	50 10 0	—
Mild Steel Tape (0·04 in.)	40 0 0	—

NEW COMPANIES

Extracted from the Register issued by Jordan and Sons, Ltd., 116 Chancery Lane, London, W.C.2.

Ajax Supplies (Welling) Ltd., 74 Bellegrove Rd., Welling, Kent. Manufacturers of and dealers in electrical apparatus and accessories, particularly wireless and radio sets, etc. Cap.: £5,000. Dirs.: M. A. Jacobs and Marie Jacobs.

Auto-Fillers Ltd., 61 Portland Place, W. Mechanical, electrical and general engineers, etc. Cap.: £100. Dirs.: E. Graham and O. Reeves.

Bridisco Ltd., 591 Green Lanes, N.8. To acquire business of British Distributing Co., manufacturers of and dealers in electrical, mechanical, radio and scientific instruments, etc. Cap.: £1,000. Dirs.: Winifred F. Aldington and B. P. Aldington.

Burden and Parker, Ltd. 47 Church St., Weybridge, Surrey. Electricians, mechanical engineers, manufacturers of and dealers in radio and television apparatus, etc. Cap.: £2,000. Dirs.: Mrs. M. D. Williams, C. T. Burden and T. L. Parker.

S. A. & M. Cohen Ltd. Iron, metal, scrap and electrical plant merchants, etc. Cap.: £1,000 in £1 shares. Dirs.: not named. Subs.: Sylvia A. Thomas, 3 Polesworth Rd., Dagenham, Essex, and Patricia A. Beckett, 47 Duke Rd., W.4.

Duckworths (Electrical) Ltd., 188 Whalley New Rd., Blackburn. To take over business of repairers of and dealers in electrical and other cookers and refrigerators, carried on at Blackburn by John B. Duckworth and Fred Duckworth. Cap.: £1,000. Dirs.: J. B. Duckworth and F. Duckworth.

Duncan-Pope Ltd., 9 Cavendish Sq., W. Electric lamp bulb manufacturers and electrical and mechanical engineers, etc. Cap.: £2,000. Dirs.: L. D. Pope and Elizabeth W. Pope.

Elden Electronics Ltd., 20 Bloomsbury Sq., W.C.1. General, electrical, scientific and electronic engineers, etc. Cap.: £2,000. Dirs.: L. G. A. Denning and C. H. Appleby.

T.V.M. Electronics Ltd., 3a Coventry Rd., S. Norwood, S.E.25. Cap.: £100. Dirs.: F. Vogel and G. F. Stevens.

G.H.S. Electronics Ltd., 288 Station Rd., Harrow, Mddx. Electrical engineers and contractors, manufacturers of and dealers in transformers, etc. Cap.: £500. Dirs.: G. Howard-Sorrell and Marjorie E. Howard-Sorrell.

TRADE NOTES

Change of Address. From January 1, 1954, the address of the British Electrical Power Convention will be: Winsley Street, London W.1.

Expansion. The British Thomson-Houston Co., Ltd., is to double the size of its proposed new factory at Larne, Northern Ireland, it is reported. Instead of providing work for about 1,000 employees, the number is expected to be between 2,000 and 3,000.

Extension. Rich and Pattison (B'ham), Ltd., have opened a new extension to their wholesale showrooms at Jamaica Row, Birmingham 5.

New Branch. The Wholesale Fittings Co., Ltd., have this week opened a new branch at 23/25 Green Lane, Ilford, Essex. Telephone Ilford 1051 and 4319.

TRADE MARKS

This information is extracted from the Official Journal by permission of the Controller.

Cresta. B721,958. Class 7. Mixing machines, etc. Insulations and Constructions Ltd., St. John's Works, St. John's Rd., Tylers Green, Penn, Bucks.

JP in designs. **J. and P.** 700,466, 700,472, 700,478, 700,484, 700,496. Class 6. Fittings for use in wiring and transmission installations. 700,467, 700,473, 700,479, 700,485, 700,497. Class 7. Dynamos, motors and cable laying machinery. 700,468, 700,474, 700,480, 700,486, 700,498. Electrical instruments and apparatus in Class 9. 700,470, 700, 488, 700,476, 700,482, 700,500. Class 11. Lighting fittings, arc lamps and water heaters. 700,471, 700,501, 700,477, 700,483, 700,489. Class 17. Insulators and insulating materials, etc. Johnson and Phillips Ltd., Victoria Way, Charlton, S.E.7.

Polyvil. 719,609. Class 17. Adhesive tape. John Gosheron and Co., Ltd., Gayford Rd., W.12.

Regent. 721,753. Class 8. Electric razors. F. Morris and Co., 72 Tottenham Court Rd., W.1.

Resistac. 717,525. Class 11. Ventilating fans. Industrial Fan and Heater Co. Ltd., Airflo Works, Evelyn Rd., Birmingham 11.

Robelec. 720,857. Class 6. Conduit fittings made of brass. J. H. Robinson & Co. (Liverpool) Ltd., Mill Lane, Old Swan, Liverpool 13.

Sterl-a-fone. 721,475. Class 11. Telephone sterilising apparatus by ultra violet rays. Sterl-a-Fone Electrical Sterilisers, 868 Green Lanes, N.21.

BUSINESS PROSPECTS

Armagh T.C. Plans approved for erection of 56 houses and 4 flats in Cathedral Rd., for N.I. Housing Trust.

Ayr. Approval in principle given to erection of junior secondary school at Drongan.

Bexley (Kent) T.C. C. John Mann and Sons, 25 Bedford Row, W.C.1, will probably be quantity surveyors for rebuilding Bexleyheath secondary school.

Billingham-on-Tees U.D.C. Erection of 109 houses on Roseberry estate. Tenders to be invited soon.

Bootle T.C. Erection of 90 houses on Netherton estate. Borough Surveyor, Town Hall.

Bristol T.C. Construction of alteration and additions at Merrywood grammar school. City Architect, Council House, College Green.

Calne (Wilts.) T.C. Twenty-four houses to be built at Wessington and 24 flats at Broken Cross.

Cardigan T.C. Plans approved for 100 houses at Greenland Meadows.

Chester R.D.C. Layout approved for 34 houses at Huntington and 18 at Stoak.

Chester-le-Street R.D.C. Building of 3-storey flats on Elizabethville estate is being planned.

Dorchester T.C. Layout plan approved for erection of primary school in Damers Road.

Durham R.D.C. Loan sanction for £93,062 sought for erection of 82 houses.

Easington. R.D.C. has approved plans for factory at Peterlee for J. Ambler and Sons, Bradford. Architect is W. Holford, 80 Bedford St., Liverpool.

Fareham (Hants.) U.D.C. Erection of 36 dwellings at Portchester. Engineer and Surveyor, Westbury Manor.

Fife. Approval given to erection of high school at Kirkcaldy and extension to Templehall school.

Gainsborough U.D.C. It is proposed to build block of shops with 14 flats on White's Wood Lane estate.

Gateshead T.C. Alterations and extensions to be carried out at mineral water factory in King St. by Fentiman's Direct Supply Co., Ltd. Architects are J. G. Crowe and Son, Central Chambers, Chester-le-Street.

Harrogate. Governors of Ashville College propose to carry out extensions at cost of about £80,000.

Henley-on-Thames T.C. Construction of 56 dwellings on Abraham's site. Eric G. V. Hives, architect, 3 Cork St., Reading.

Hull T.C. Application to be made for sanction to borrow £134,135 for Jervis Boys' school on Bilton Grange estate; work expected to begin before April. Also, sketch plans approved for police headquarters at Queen's Gardens. First stage estimated to cost £75,000.

Larne (Antrim) R.D.C. Application to be made to borrow £230,000 for erection of 150 houses on No. 3 scheme.

Leicestershire. New modern school estimated to cost £151,000 to be included in current programme.

Liverpool T.C. Erection of 63 dwellings on Finch House estate. City Architect, Blackburn Chambers, Dale St., Kingsway.

London. Multi-storey building to be erected off Leadenhall St. for Lancashire General Investment Co., Ltd. Architects are Alan W. Pipe and Sons, 8 Queen St., Cheapside, E.C.4. Also London Assurance plan to build block of offices in St. Swithin's Lane, and architects in this case are Whinney, Son and Austen Hall, 37 Norfolk St., W.C.2.

Middlesbrough. Planning permission given for proposed £170,000 Longlands county college, and the Middle Beck No. 2 secondary technical school. Also T.C. invites tenders for erection of 82 houses at Park End. Borough Engineer, Town Hall.

Mossley T.C. Erection of 26 houses and 12 flats on Micklehurst site. Howard and Benson, chartered architects, 88 Mossley St., Manchester.

Nantwich (Chesh.) U.D.C. Permission sought to borrow £76,000 for further 52 flats on Millfield estate and 10 houses on Hillfield site.

Paddington. Scheme proposed for erection of two 7-storey blocks containing 60 flats and another of 70 flats on Barrie St. site. Estimated cost £498,410.

Peel (I.o.M.) Corrin Trust is planning to build convalescent and residential home off Albany Rd. at estimated cost of £30,000.

Port Talbot T.C. Erection of 100 houses at Gt. Warren, Aberavon. G. V. Griffiths, Borough Engineer, Municipal Buildings.

St. Albans R.D.C. Erection of 54 dwellings on Langley Grove estate, Sandridge. Architect, 43 Upper Lattimore Rd.

Scotland. Erection of 36 houses at Whitburn and 50 at Airdrie. Scottish Special Housing Assoc., 15-21 Palmerston Place, Edinburgh.

West Riding. All trades for erection of sub-divisional police H.Q. and dwellings at Shipley. County Architect, Bishopgarth, Westfield Rd., Wakefield.

York T.C. Erection of seven blocks of old persons' dwellings on Moor Lane estate. E. Firth, City Architect, 8 St. Leonard's Place.

GAZETTE ANNOUNCEMENTS

COMPANIES ACTS

Hooper's Telegraph and India Rubber Works Ltd. Final meeting of members will be held at offices of Edward Moore and Sons, Thames House, Queen St. Place, E.C.4, on Dec. 7, at 11 a.m. to receive liquidator's report.

S. and T. Martin Ltd. First and final dividends of 2s. 0·438d. in £ payable at Official Receivers' Office, Inveresk House, 346 Strand, W.C.2, any day after Oct. 30, between 11 a.m. and 2 p.m., except Sat.

Streamlyne Electrics Ltd. Resolution for winding-up passed at meeting of Oct. 5. At meeting of creditors statement of affairs showed liabilities of £3,049, of which £2,999 was due to trade creditors. Assets estimated to produce £1,245 and after allowing £114 for preferential claims there were net assets of £1,130, or deficiency of £1,918. Resolution passed confirming voluntary liquidation with Mr. A. W. Hunter, acc., of Latham and Co., 418/422 Strand, W.C.2, as liquidator, with committee of inspection.

MEETINGS TO NOTE

THURSDAY, NOV. 5

I.E.E. (London).—"Co-ordination of Insulation of h.t. Electrical Installations." Savoy Place, W.C.2, 5.30 p.m.

INST. OF FUEL (London).—"French Power Resources and their Utilisation." J. Couture. Inst. of Mechanical Engrs., Storey's Gate, 5.30 p.m.

BRIT. INSTN. OF RADIO ENGRS. (Scottish).—"Vibration Generators." H. Moore. Annual meeting. University, Edinburgh, 7 p.m.

BRIT. INSTN. OF RADIO ENGRS.—(Merseyside).— "Multi-Channel Tuners for TV." S. L. Fife and W. E. Hosey. Elect. Showrooms, Whitechapel, Liverpool, 7 p.m.

I.E.S. (Cardiff).—"Miniature Lamps and Special Applications." W. A. Kimber. Elect. Board, The Hayes, 5.45 p.m.

I.E.S. (Glasgow).—"Plant Cultivation and Artificial Light." J. B. R. Anderson, 39 Elmbank Crescent, 6.30 p.m.

I.E.S. (Glos. and Cheltenham).—"New Lamps, New Uses and Techniques." R. V. Mills, Cadena Cafe, High St., Cheltenham, 6.30 p.m.

INCORP. PLANT ENGRS. (Peterborough).—"The Heat Pump." Gas Board Church St., 7.30 p.m.

A.S.E.E. (S. London).—"Electrical Maintenance." P. H. Usher. Cafe Royal, Croydon, 8 p.m.

FRIDAY, NOV. 6

INST. OF FUEL (S. Wales).—"Development of Electrical Industry in S. Wales." H. J. Bennett. Royal Instn., Victoria Rd., Swansea, 6 p.m.

I.E.E. (Swansea).—Annual dinner and dance at Langland Bay Hotel.

I.E.S. (Birmingham).—"Radiation from Space." M. C. Johnson. Regent Hse., St. Phillip's Place, Colmore Row, 6 p.m.

JNR. INSTN. OF ENGINEERS (London).—"Peak Loads and Heat Storage." W. Goldstein. Alliance Hall, Palmer St., S.W.1, 7 p.m.

A.S.E.E. (Liverpool).—"Consumers' Substations." K. Helliwell and W. J. Foster. Elect. Showrooms, Whitechapel, 7.30 p.m.

MONDAY, NOV. 9

A.S.E.E. (Central London). "B.E.A.—Progress since Vesting Day." V. A. H. Clements. St. Ermin's Hotel, Caxton St., S.W.1, 7 p.m.

I.E.E. (London Education).—Discussion on "Requirements of Electrical Engineering Textbooks." Instr. Cdr. D. K. McCleery. Savoy Place, W.C.2, 6 p.m.

I.E.E. (Mersey and N. Wales).—Annual dinner at Exchange Hotel, Liverpool, 6.30 p.m.

I.E.E. (N. Eastern).—"Assessment of Impregnated Pressure Cable." L. G. Brazier, D. T. Hollingsworth and A. L. Williams. Neville Hall, Westgate Rd., Newcastle, 6.15 p.m.

INST. OF FUEL (N. East).—"Waste Heat Recovery by Turbines." G. L. Duffett. King's College, Newcastle, 6.30 p.m.

I.E.E. (S. Midland Supply and Utilisation).—"Circuit-Breaking by High-Voltage Circuit-Breakers, special reference to Current-Chopping." A. F. B. Young. Imperial Hotel, Birmingham, 6 p.m.

I.E.E. (Western).—"Testing and Specification of Bushings in relation to Service Conditions." H. Barker and H. Davies. S.W. Elect. Board, Colston Ave., Bristol, 6 p.m.

LEICESTER ELECTRICAL SOC.—"Time Switches—Development and Applications." E. M. Selley. Elect. Offices, Rutland St. entrance, 7 p.m.

I.E.S. (Sheffield).—"Lighting in Crime Detection." C. H. Edlin. The University, Western Bank, 6.30 p.m.

TUESDAY, NOV. 10

A.S.E.E. (N.W. London). Film show at Rest Hotel, Kenton Lane, Kenton, 8.15 p.m.

I.E.E. (London Measurements).—Section dinner at Cafe Royal, Regent St.

I.E.E. (N. Ireland).—"Design Features of Certain British Power Stations." S. D. Whetman and A. E. Powell. Presbyterian Hostel, Howard St., Belfast, 6.15 p.m.

INSTN. OF WORKS MANAGERS (Birmingham).—"Material Handling for Small and Large Factories." L. Landon Goodman of E.D.A. Grand Hotel, 7 p.m.

NEWPORT ELECTRIC CLUB.—"Electrics used on Process Lines." R. G. Raydon. Tredegar Arms Hotel, 7 p.m.

I.E.S. (London).—"Fluorescent Dimming Circuits." M. H. Bollin and W. J. Vine. Wellcome Research Instn., Euston Rd., N.W.1, 6 p.m.

I.E.S. (Stoke-on-Trent).—"Irradiation of Plants." J. J. French. Elect. Board, 31 Kingsway, 6 p.m.

INCORP. PLANT ENGRS. (Manchester).—"Illumination and Factory Lighting." Engineers' Club, Albert Sq., 7.15 p.m.

WEDNESDAY, NOV. 11

A.S.E.E. (Bradford). Film show at Midland Hotel, 7.30 p.m.

A.S.E.E. (York). "Cold Cathode Lighting." J. M. Stanford. City Hotel, Lendal, 7.30 p.m.

I.E.E. (London Radio).—"Aspects of Design of V.H.F. Mobile Radio Systems." E. P. Fairbairn. Savoy Place, W.C.2, 5.30 p.m.

I.E.E. (N. Lancs). "Control of Thermal Neutron Reactor." R. V. Moore. Elect. Board, North Rd., Lancaster, 7.15 p.m.

I.E.E. (N. Scotland).—"Electronic Telephone Exchanges." T. H. Flowers. Caledonian Hotel, Aberdeen, 7.30 p.m.

INST. OF FUEL (N. West).—Members Night at Engrs. Club, Albert Sq., Manchester, 6.30 p.m.

INSTN. OF HEATING AND VENTILATING ENGRS. (London).—Symposium of 7 papers at Inst. of Mechanical Engrs. Storey's Gate, S.W.1, 2.30 p.m. and 6 p.m.

BRIT. INSTN. OF RADIO ENGRS. (N. Eastern).—"Principles of Electronic Computing Machines." Dr. B. V. Bowden. Instn. of Mining and Mechanical Engrs., Newcastle, 6 p.m.

BRIT. INSTN. OF RADIO ENGRS. (London).—Symposium of papers on Vibration Methods of Testing Electronic Components and Equipment. School of Hygiene, Keppel St., W.C.1, 6.30 p.m.

INCORP. PLANT ENGRS. (E. Midlands).—"Cost and Works Accounting for Works Engineers." S. H. Alloway. Gas Board, Parliament St., Nottingham, 7 p.m.

THURSDAY, NOV. 12

ENGINEERS' GUILD. "Engineers' Guild—Purpose and Value." H. Nimmo, G. E. M. Godfrey and R. W. H. Couzens. Recruitment meeting at Caxton Hall, Westminster, 6 p.m.

I.E.E. (London).—Discussion on "Safety Precautions in Electronic Apparatus, especially Medical Applications." H. W. Swann and W. Grey Walter. Savoy Place, W.C.2, 5.30 p.m.

I.E.E. (N. Scotland).—"Electronic Telephone Exchanges." T. H. Flowers. Royal Hotel, Dundee, 7 p.m.

I.E.E. (Swansea).—"Electricity in Farm Crop-Drying." C. A. Cameron Brown. Public Library, Alexandra Rd., 6 p.m.

E.P.E.A. (Merseyside).—"H.V. Fault Location." D. J. A. Shirt and L. S. Herbert. Elect. Showrooms, Whitechapel, Liverpool, 7.p.m.

I.E.S. (Birmingham).—Ladies' Night at Queen's Hotel.

I.E.S. (Manchester).—Members Night at Elect. Board, Town Hall Extension, 6 p.m.

I.E.S. (Nottingham).—"TV Studio Lighting." D. C. Lightbody. Elect. Board, Smithy Row, 6 p.m.

I.E.S. (Bradford).—"New Lamps, New Uses and New Techniques." H. R. Ruff. Y.E.B., 45-53 Sunbridge Rd., 7.30 p.m.

FRIDAY, NOV. 13

A.S.E.E. (Stoke and Crewe). "Applications of Pyrotenax." H. J. Hansen. Copeland Arms Hotel, Stoke, 7.30 p.m.

E.I.B.A.—Annual dinner and ball at Grosvenor House, London.

I.E.E. (N.W. Utilisation).—Dinner-dance at Lesser Free Trade Hall, Peter St., Manchester, 7 p.m.

I.E.E. (S.W. Scotland).—"Nuclear Reactors and their Applications." Sir John Cockcroft. 39 Elmbank Crescent, Glasgow, 7 p.m.

SOC. OF CHEMICAL INDUSTRY (Corrosion Group).—Symposium on Cathodic Protection. I.E.E., Savoy Place, W.C.2, 9.45 a.m.

ASSOC. ELECTRICAL MACHINERY TRADES.—Annual dinner at Savoy Hotel, London.

EXHIBITION DIARY

Fuel Efficiency.—To be held in Manchester between Nov. 18 and 28.

Building.—To be held at Olympia, London, between Nov. 18 and Dec. 2.

HENLEY

REMEMBER POPPY DAY

IRONCLAD SERVICE FUSES

DOUBLE-POLE

for use in lighting columns

These HENLEY Ironclad Service Fuses are designed specially for use in columns for outdoor lighting installations. Both are fitted with a fuse and neutral and suitable for maximum working current of 15 amp. The fuse can be supplied suitable for cartridge fuse-links or, alternatively, for wire fuse-elements.

STREET LIGHTING · FACTORY YARDS
CAR PARKS · RACETRACKS · FAIR GROUNDS
EXHIBITIONS · SPORTS ARENAS · FLOODLIGHTING

Compact · Robust

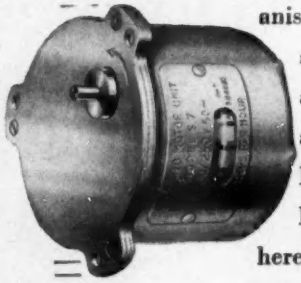
Write for Folder 49/A

Single-Entry type *Loop-in type*

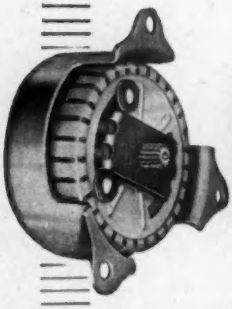
W. T. HENLEY'S TELEGRAPH WORKS CO., LTD. 51-53 HATTON GARDEN, LONDON, E.C.1

MOTIVE POWER *for* TIMING MECHANISMS

Sangamo Synchronous Motors and Motor Units are designed to provide motive power for a wide variety of A.C. mechanisms. They are used in applications such as electric clocks, recording apparatus, process timers, medical apparatus, advertising displays etc. Details of the Sangamo Model S7 Motor Unit and Type G Motor (shown here) and also of the Model S7 Clock Unit will be sent on request.



Model S7 Motor Unit
Incorporates Synchronous Motor as below, with gearing in a sealed dust-proof housing. Standard speeds from 3,600 revolutions per hour to 1 revolution in 7 days.



Type G Motor
This Synchronous Motor (which also forms the power unit of the S7 motor and clock units) is of the slow speed, self-starting type and operates at 200 r.p.m. at 50 cycles.
Torque: 4·5 cm. grms.

SANGAMO WESTON LTD
ENFIELD - MIDDLESEX

'Phone: Enfield 3434 (6 lines) and 1242 (4 lines).
'Grams: "Sanwest" Enfield.

London, Glasgow, Manchester, Newcastle-on-Tyne, Leeds, Liverpool, Wolverhampton, Nottingham, Bristol, Southampton and Brighton.

CLASSIFIED ADVERTISEMENTS

OFFICIAL TENDERS AND APPOINTMENTS

WORK WANTED WANTED · FOR SALE

Those wishing to advertise in these pages should send the text to the Classified Advertisement Dept., Electrical Times, Sardinia House, Sardinia Street, London W.C.2, before 10 a.m. on TUESDAY of week of issue. Official Displayed Advertisements are charged at 42s. per inch, and all other classified advertisements at 3s. per line. Situations Wanted will be published four times for twice the single insertion rate. Fee for Box No. and postage on replies is 2s.

TENDERS INVITED

COUNTY BOROUGH OF BOURNEMOUTH

EQUIPMENT FOR SUB-STATIONS

TENDERS are invited for the supply of electrical equipment for sub-stations. Specification and details may be obtained from the General Manager, Corporation Transport Services, 99-101 Southcote Road, Bournemouth.

Tenders, in sealed envelopes bearing the words "Tender for Equipment for Sub-stations," to be received by the undersigned by November 30, 1953.

The Council do not bind themselves to accept the lowest or any tender.

A. LINDSAY CLEGG,
Town Clerk.

Bournemouth. (F 495)

BOROUGH OF WREXHAM

GROUP "A" AND "B" STREET LIGHTING

TENDERS are invited for the supply only of the following items: 20 No. steel columns and brackets having a mounting height of 25 ft; 160 No. steel or cast iron columns and brackets having a mounting height of 15 ft; 60 No. concrete columns and brackets having a mounting height of 15 ft; 20 No. 250 W mercury vapour lanterns; 50 No. 125 W mercury vapour lanterns; 170 No. 100 W tungsten lanterns.

Drawings and conditions of contract may be inspected at the office of the Borough Engineer and Surveyor, 31 Chester Street, Wrexham, from whom copies of the specification and forms of tender may be obtained on payment of a deposit of two guineas, which will be refunded on receipt of a bona-fide tender.

Tenders, in the appropriate plain envelope, sealed and endorsed "Street Lighting," should reach the undersigned not later than first post on Monday, November 16, 1953

The Council do not bind themselves to accept the lowest or any tender.

PHILIP J. WALTERS,
Town Clerk.

Guildhall,
Wrexham.
October 28, 1953. (F 496)

CITY OF BELFAST

Electricity Department

110 kV CABLES, ETC.

TENDERS are invited for the SUPPLY, DELIVERY, LAYING, ERECTION and MAINTENANCE of 110 kV oil-pressure or gas-pressure type and 33 kV main cables, auxiliary cables and accessories for Belfast Municipal Electric Power Station West to Donegall Sub-station Interconnector.

Form of tender (No. N.1235), conditions, specification and drawings, in quintuplicate, may be obtained from Messrs. Merz and McLellan, Consulting Engineers, Carliol House, Newcastle-upon-Tyne 1, on payment of a deposit of five guineas which will be refunded provided a bona fide tender is lodged and not withdrawn. Extra copies of the contract documents may be obtained at one guinea each; this sum will not be returnable. Cheques should be made payable to the Belfast Corporation Electricity Department.

Each tender, in quadruplicate, in sealed envelope marked "Tender for 110 kV Cables, etc., Electricity Committee," and endorsed with the name and address of the tenderer, must reach the undersigned not later than 4 p.m. on Friday, December 18, 1953.

An official receipt must be obtained for each tender delivered by hand. Tenders sent by post should be registered.

The lowest or any tender will not necessarily be accepted.

JOHN DUNLOP,
Town Clerk.

City Hall,
Belfast.
October 30, 1953. (F 529)

APPOINTMENTS VACANT

Engagement of persons must be made through a Local Labour Office or Scheduled Employment Agency, if the applicant is a man aged 18-64, or a woman aged 18-59; unless the person concerned is excepted or the employment is in a managerial or professional capacity, or is otherwise excepted from the provisions of the Notification of Vacancies Order, 1952.

SOUTH EAST SCOTLAND ELECTRICITY BOARD

Lothians Sub-Area

APPLICATIONS are invited for the post of SECOND ASSISTANT ENGINEER (Meters) at Sub-Area Headquarters. Applicants should be corporate members of the Institution of Electrical Engineers or have passed the qualifying examination and should have had wide experience in the operation of an electricity supply undertaking's meter test department handling all classes of meters and metering equipment.

Salary will be in accordance with the N.J.B. Agreement, Class "G," Grade 7, £727-£756, with superannuation.

Applications stating age, education and qualifications and giving full details of experience should be addressed to Manager, South East Scotland Electricity Board, Lothians Sub-Area, Musselburgh, Midlothian, to be received not later than Monday, November 16, 1953.

(F 472)

NORTH EASTERN ELECTRICITY BOARD

York Sub-Area

APPLICATIONS are invited for the appointment of SENIOR ASSISTANT ENGINEER, Operation and Maintenance, at Sub-Area Headquarters.

Applicants should be suitably qualified electrical engineers and have had a sound technical and practical training. Experience of the operation and maintenance of h.v. and l.v. systems, including experience of installing and testing of protection and plant required.

Salary: Schedule "A," Class "G," Grade 4, £903/£944, N.J.B. conditions of service.

Applications, stating age, qualifications and experience, should be forwarded to the Secretary (Establishments), The North Eastern Electricity Board, Carliol House, Newcastle-upon-Tyne 1, within ten days of the appearance of this advertisement. (F 498)

BRITISH ELECTRICITY AUTHORITY

North Western Division

VACANCY No. 245/53. STATION SHIFT CONTROL ENGINEER, Carlisle Generating Station. Salary: £577/£598 (F.10).

Vacancy No. 246/53. ASSISTANT SHIFT CHARGE ENGINEER, Hartshead Generating Station, Stalybridge. Salary: £641/£667 (G.9).

Vacancy No. 247/53. STATION SHIFT CONTROL ENGINEER, Blackburn Generating Station. Salary: £608/£630 (G.10).

Vacancy No. 248/53. ASSISTANT SHIFT CHARGE ENGINEERS, Chadderton H.P. Generating Station, Oldham. Salary: £641/£667 (G.9).

Vacancy No. 249/53. STATION SHIFT CONTROL ENGINEER, Padiham Generating Station. Salary: £555/£589 (E.10).

Vacancy No. 250/53. STATION SHIFT CONTROL ENGINEER, Nelson Generating Station. Salary: £531/£547 (D.10).

Apply, quoting Vacancy No., to Establishments Officer, British Electricity House, 625 Wilmslow Road, Manchester 20, before November 14. (F 504)

YORKSHIRE ELECTRICITY BOARD

No. 7 (Grimsby) Sub-Area

THIRD ASSISTANT ENGINEER (Commercial)

APPLICANTS, who should preferably have some technical qualification or training, will be required to assist with the preparation of tenders and estimates for street lighting and industrial supplies and should have experience of this type of work within the electricity supply industry.

Salary, N.J.B. Class "G," Grade 10, £608 to £630 per annum.

THIRD ASSISTANT ENGINEER
(Operation and Maintenance)

Candidates should preferably be Corporate Members of the Institution of Electrical Engineers or hold equivalent qualifications, and should be fully experienced in the operation and maintenance of h.v. and l.v. overhead and underground transmission and distribution systems, substation plant and ancillary equipment throughout the Sub-area.

Salary, N.J.B. Class "G," Grade 10, £606 to £630 per annum.

GENERAL ASSISTANT ENGINEER
(Operation and Maintenance)

Candidates should preferably be Graduates of the Institution of Electrical Engineers or hold the Higher National Certificate in Electrical Engineering or an equivalent qualification. They should be fully experienced in the operation and maintenance of h.v. and l.v. overhead and underground transmission and distribution systems, substation plant and ancillary equipment throughout the Sub-Area.

Salary, N.J.B. Class "G," Grade 13, £496 to £514 per annum.

Grimsby District
SENIOR SALES REPRESENTATIVE

Applicants must have practical experience in negotiating with and advising consumers in respect of new supplies and in the sale and use of equipment for domestic, small commercial or industrial supplies.

Salary, N.J.C. Grade 2, £460 to £520 per annum.

SALES REPRESENTATIVE

Applicants will be required to give advice within well defined instructions, and under close supervision, to both urban and rural consumers in respect of new supplies and sales of domestic and agricultural equipment, and to advise consumers on all types of domestic and agricultural installations and prepare estimates in this connection.

Salary, N.J.C. Grade 1, £380 to £470 per annum.

Scunthorpe District
SALES REPRESENTATIVE

Applicants will be required to give advice within well defined instructions, and under close supervision, to both urban and rural consumers in respect of new supplies and sales of domestic and agricultural equipment, and to advise consumers on all types of domestic and agricultural installations and prepare estimates in this connection.

Salary, N.J.C. Grade 1, £380 to £470 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 7 (Grimsby) Sub-Area, Yorkshire Electricity Board, Moss Road, Grimsby, not later than November 19, 1953.

No. 5 (Wakefield) Sub-Area

Barnsley District
GENERAL ASSISTANT DISTRICT ENGINEER
(two vacancies)

Applicants must have had a sound practical training with experience in the construction, operation and maintenance of h.v. and l.v. overhead and underground distribution networks, substation plant and ancillary equipment.

Applicants must hold a current driving licence, be prepared to reside in the district and undertake standby duties.

Preference will be given to those who are Corporate Members of the Institution of Electrical Engineers or who hold equivalent qualifications.

Salary, N.J.B. Class "F," Grade 11, £548 to £565 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager No. 5 (Wakefield) Sub-Area, Yorkshire Electricity Board, 1a Denby Dale Road, Wakefield, not later than November 19, 1953.

(F 506)

THE ASSOCIATION OF SUPERVISING ELECTRICAL ENGINEERS

maintains an EMPLOYMENT REGISTER for all supervisory and executive grades of electrical engineers and technicians.

Employers wishing to make use of this *free service* should write to the General Secretary, A.S.E.E. (Dept. ET), 54 Station Road, New Barnet, Herts. (F 361)

SOUTH WALES ELECTRICITY BOARD

REQUIRED, GENERAL ASSISTANT ENGINEER (Mains), at Pforestfach in the West Central Sub-Area.

The successful applicant will be required to undertake pressure testing and fault location, and to assist generally in the mains section, particularly on the operational side.

The salary will be in accordance with Class "L," Grade 13 (£616/£631/£646), of N.J.B. Schedule.

Applications, stating age, present position and salary, qualifications and experience, together with three referees, to be addressed to the Secretary, to arrive by November 14, 1953.

D. G. DODDS,
Secretary.

St. Mellons,
Cardiff.

(F 532)

COUNTY BOROUGH OF ST. HELENS

Borough and Water Engineer's Department

APPLICATIONS are invited for the appointment of ASSISTANT LIGHTING ENGINEER on the permanent establishment, on salary grade A.P.T. VI (£670 rising to £735 per annum). Applicants must have had extensive practical experience of design, installation and maintenance of all forms of modern street lighting, including warning and direction signs, have administrative experience and be capable of assuming control of the Lighting Section of the department under the direction of the Borough Engineer.

The appointment will be subject to the Scheme of Conditions of Service of the National Joint Council for Local Authorities' A.P.T. and Clerical Services and to the provisions of the Local Government Superannuation Act, 1937, and the successful candidate will be required to pass a medical examination.

Candidates must, when making application, disclose in writing whether to their knowledge they are related to any member of the Council or holder of any senior office under the Council.

Applications, stating age, qualifications, present and past appointments and details of experience, accompanied by copies of three recent testimonials, must be forwarded to the undersigned not later than Monday, November 23, 1953.

Canvassing in any form will be deemed a disqualification.

M. WARD, M.I.Mun.E.,
Borough Engineer.

Town Hall,
St. Helens.
October 28, 1953.

(F 505)

SOUTH EASTERN ELECTRICITY BOARD

DISTRICT MANAGER
Maidstone District

COMMENCING salary will be within the provisional scale £1,175 by £50 to £1,325 per annum, and the date of the appointment will be July 31, 1954. Superannuable.

The district has over 26,000 consumers, an area of 114 sq. miles, and unit sales of approximately 107 millions per annum. Applicants should preferably be Corporate Members of the I.E.E., and accustomed to the planning, operation and management of an electricity supply undertaking. Experience in the negotiation of industrial commercial and farm tariffs, the control of a contracting department and showroom, in staff relations and joint consultation, is desirable.

Applications, giving two referees, should reach H. F. Knell, M.B.E., J.P., M.I.E.E., Sub-Area Manager, SEEBoard, 178/184 High Street, Rochester, Kent, by November 16, 1953.

A. L. BURNELL,
Secretary.

November, 1953.

(F 541)

SOUTH WEST SCOTLAND ELECTRICITY BOARD

Ayrshire Sub-Area

APPOINTMENT OF
THIRD ASSISTANT ENGINEER (CONSTRUCTION)

APPLICATIONS are invited for the position of Third Assistant Engineer (Construction) at Sub-Area Headquarters, Kilmarnock.

Applicants should be experienced in the construction of sub-stations, h.v. and l.v. overhead and underground mains and be Graduates of the I.E.E. or possess equivalent qualifications.

Salary in accordance with National Joint Board Agreement, Schedule A, Class "G," Grade 10, £608 to £630 per annum.

Forms of application may be obtained from the undersigned or any other Sub-Area Manager, and should be returned to me duly completed with any additional information not later than November 16, 1953.

A. E. ROOTS,
Manager.

Greenholm Street,
Kilmarnock.
October 30, 1953.

(F 540)

NORTH WESTERN ELECTRICITY BOARD

APPOINTMENT OF CHIEF ENGINEER

APPLICATIONS are invited for the position of Chief Engineer to the Board at a commencing salary of £2,700 per annum.

Applicants must be fully qualified electrical engineers and have wide experience in the administration of large engineering organisations.

Applications, stating age, qualifications, experience, present post and salary, should be received by the Establishment Officer, The North Western Electricity Board, Cheetwood Road, Manchester 8, not later than November 21, 1953. (F 501)

ELECTRICITY SUPPLY BOARD

VACANCY FOR COMMUNICATIONS TECHNICIAN CLASS II.

THE Electricity Supply Board invites applications for a position on its staff as Communications Technician Class II.

Applicants should have a sound knowledge of automatic telephone exchanges and associated power plants. It is desirable, but not essential, that applicants should have a knowledge of repeater or carrier equipment and/or teleprinters.

The rate of pay is 3s. 8id. x 1d. to 3s. 10id. x 2d. to 4s. 0id. per hour, according to experience, for a 44-hour week.

Applications, which must indicate date of birth and educational standard attained, together with particulars of technical qualifications in telecommunications and practical experience in maintaining automatic equipment, should be addressed to the Board's Personnel Officer, 27 Lower Fitzwilliam Street, Dublin, and reach him not later than Thursday, November 12, 1953.

PATRICK J. DEMPSEY,
Secretary.
(F 500)

EASTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments:—

Northmet Sub-Area

Harrow and Tottenham Districts
GENERAL ASSISTANT ENGINEERS

Candidates should have had a sound training in electrical engineering and experience of the construction, operation and maintenance of underground systems up to 33 kV.

The salaries will be in accordance with the National Joint Board Salary Agreement, as follows:—

Harrow District: Class "F," Grade 11, commencing at £518 plus London Allowance.

Tottenham District: Class "E," Grade 11, commencing at £524 plus London Allowance.

Apply to the appropriate District Manager at the following addresses:—

District Manager—Harrow, Eastern Electricity Board, 4 College Road, Harrow, Middlesex.

District Manager—Tottenham, Eastern Electricity Board, 312 High Road, Tottenham, London N.15.

Essex Sub-Area

JUNIOR ENGINEER

Candidates should have had a sound technical education up to Higher National Certificate standard and some experience of H.V. and L.V. distribution systems.

The appointment will be in the South West Essex District and the salary will be in accordance with the National Joint Board Salary Agreement, Class "G," Grades 16 to 14, within a range of £402 to £491, plus London Allowance, commencing at a point appropriate to the qualifications and experience of the successful candidate.

Apply to the District Manager, South West Essex District, Eastern Electricity Board, 1 Havana Close, South Street, Romford, Essex.

South West Essex District
GENERAL ASSISTANT ENGINEER

Candidates should have had a sound training in electrical engineering and experience in the construction, operation and maintenance of H.V. and L.V. underground and overhead distribution systems.

The salary will be in accordance with the National Joint Board Salary Agreement, Class "G," Grade 11, commencing at £573, plus London Allowance.

Apply to the District Manager, South West Essex District, Eastern Electricity Board, 1 Havana Close, South Street, Romford, Essex.

Future salary and conditions of service for the above appointments will be in accordance with agreements made from time to time by the appropriate negotiating bodies.

The successful candidates will be required to contribute to a superannuation scheme and may be required to undergo a medical examination.

Applications, by letter, stating age, education, qualifications and experience, with details of present appointment and salary, should be submitted to the Manager concerned, within fourteen days of the appearance of this advertisement. (F 536)

NORTH WESTERN ELECTRICITY BOARD

APPOINTMENT OF
GENERAL ASSISTANT ENGINEER
(TESTING ASSISTANT)

Sub-Area Testing Station, Salford

APPLICANTS should be experienced in testing meters, instruments (including standardisation), cables, protection equipment and substation plant, and should hold H.N.C. in Electrical Engineering or its equivalent. Experience in a manufacturer's works will be an advantage.

Salary scale £661 to £681 per annum, Grade "M.13." N.J.B. conditions.

Appointment of
SECOND ASSISTANT ENGINEER
(Building Construction), Sub-Area Mains Engineer's Department, Manchester

The successful applicant will be responsible to the Section Head (Construction) for the control and operation of a sub-section composed of members of all trades in the building industry. The sub-section will carry out the repair and maintenance of all the Board's premises within the Sub-Area and the erection of new substations, office blocks, etc.

Applicants must have had a wide experience in the control of labour, supervision of contractors, estimating and costing, and must have had practical experience in building design.

Salary scale £906 to £1,017 per annum, Grade "M.7." N.J.C. conditions.

Applications for above posts, stating age, qualifications and experience, present post and salary, to the Sub-Area Secretary, No. 1 Sub-Area, The North Western Electricity Board, Town Hall, Manchester, P.O. Box 413, by November 14, 1953.

Appointment of
THIRD ASSISTANT ENGINEER

Sub-Area Mains Engineer's Department, Preston

Applicants should have had a wide experience in the construction, operation and maintenance of large industrial and rural networks, including o.h. lines and u.g. cables at voltages up to 33 kV and in high voltage testing and fault localising. The person appointed will be required to undertake stand-by duty.

Preference will be given to candidates who have had experience in the control of 33 kV substations and systems.

Salary scale £719 to £770 per annum, Grade "K.10." N.J.B. conditions.

Applications to the Manager, No. 4 Sub-Area, The North Western Electricity Board, 40-41 Lune Street, Preston, by November 14, 1953.

Appointment of
SECOND ASSISTANT ENGINEER

Domestic and Commercial Development Section, Sub-Area Consumers' Engineer's Department, Hazel Grove.

Applicants should have experience in connection with the following: Domestic and commercial sales, including hire and hire-purchase; domestic and commercial sales development; agricultural and horticultural applications of electricity; organisation of exhibitions and demonstrations; publicity and display and supervision of service centres.

Salary scale £720 to £756 per annum, Grade "G.7." N.J.B. conditions.

Appointment of
SECOND ASSISTANT DISTRICT COMMERCIAL ENGINEER
(Sales Superintendent), Macclesfield District

Applicants should be experienced in the supervision of Service Centres, organisation of exhibitions, demonstrations and displays, and contracting and servicing work in a District, and should preferably hold O.N.C. and H.N.C. in Electrical Engineering.

Salary scale £649 to £681 per annum, Grade "E.7." N.J.B. conditions.

Application forms can be obtained from the Sub-Area Manager, No. 7 Sub-Area, The North Western Electricity Board, Chapel Street, Hazel Grove, Cheshire, and must be returned to him by November 14, 1953. (F 507)

SOUTH WALES ELECTRICITY BOARD

REQUIRED, FIRST ASSISTANT in Commercial Department of District 348 (Cardiff West) in the Central Sub-Area.

Applicants must have had experience in the application of electricity in all its branches; negotiation of supplies, public lighting and contracting.

Salary in accordance with Class "E," Grade 5 (£740/£757/£774) of N.J.B. Schedule.

Applications, stating age, present position and salary, qualifications and experience, together with three referees, to be addressed to the Secretary, to arrive by November 14, 1953.

D. G. DODDS,
Secretary.
St. Mellons, Cardiff. (F 533)

BRITISH ELECTRICITY AUTHORITY

South West Scotland Division

ENGINEER
Barony Power Station

THE BRITISH ELECTRICITY AUTHORITY, Generation Construction Department, has a vacancy for a Site Engineer in connection with the construction of Barony Power Station, Ayrshire. Applicants should preferably be corporate members of an appropriate professional institution and have some steam power station experience. The salary payable, within the range £649/£953, will be in accordance with the ability and experience of the candidate. Compulsory superannuation scheme. Residence near the site is essential and it is hoped that a house will be available.

Applications on form A.E.6, which may be obtained from the Authority's headquarters or from any divisional office of the Authority, should be forwarded to the Divisional Secretary, British Electricity Authority, 168 Broomhill Drive, Glasgow W.1, before November 17, 1953.

A. CHRISTIANSON,
Divisional Secretary.

October 29, 1953. (F 539)

LONDON ELECTRICITY BOARD

ENGINEERING DRAUGHTSMEN

APPLICATIONS are invited for positions as Engineering Draughtsmen for electrical plant layout in the Drawing Office of the Chief Engineer's Department in central London.

Applicants should preferably have served an engineering apprenticeship and have had technical training. Experience in the layout of transforming plant, h.v. switchgear and cables would be an advantage.

The posts are graded under Schedule "D" of the N.J.B. agreement as Grade 6 (£458 to £595 7s. per annum, inclusive of London Allowance) and the commencing salaries will be dependent upon qualifications and experience.

Application forms obtainable from Establishments Officer, 46 New Broad St., E.C.2, to be returned completed by November 21, 1953. Please enclose addressed envelope and quote Ref. V/1580/T on envelope and all correspondence. (F 538)

STAFFORDSHIRE COUNTY COUNCIL

Education Committee

APPLICATIONS are invited for the following appointment in the Education Architect's Department:—
ELECTRICAL ENGINEERING DRAUGHTSMAN on Grades I, II or III of the national scales, according to qualifications and experience. Salary: £465/£570 per annum.

Candidates are required to be experienced in the design and installation of electric lighting and power installations for all types of school buildings.

Applications, with copies of two recent testimonials, together with the names and addresses of referees, should be submitted to Mr. A. C. H. Stillman, County Education Architect, Green Hall, Lichfield Road, Stafford, not later than November 20, 1953.

T. H. EVANS,
Clerk of the County Council.
(F 497)

NORTH EASTERN ELECTRICITY BOARD

Harrogate Sub-Area

APPLICATIONS are invited for the appointment of FIRST ASSISTANT DISTRICT COMMERCIAL ENGINEER at Harrogate. Applicants should have a sound technical and practical training and have experience in all aspects of service to domestic, commercial and smaller industrial consumers.

Salary: Schedule "A," Class "E," Grade 6, £690/£725. N.J.B. conditions of service.

Applications, stating age, qualifications and experience, should be forwarded to the Secretary (Establishments), The North Eastern Electricity Board, Carliol House, Newcastle-upon-Tyne 1, within 10 days of the appearance of this advertisement. (F 503)

BRITISH ELECTRICITY AUTHORITY

North Western Division

VACANCY No. 243/53. Temporary ASSISTANT RESIDENT PLANT ENGINEER (Mech.) at Carrington Generating Station site, near Manchester. Duties include progressing, supervision and checking of installation of mechanical equipment at generating station. Experience of modern power plant construction essential. Construction works scheduled for completion during 1956. Salary: £649/£883 ("AX/EX" 5). Applications to Establishments Officer, British Electricity House, 825 Wilmslow Road, Manchester 20, before November 14. Quote vacancy number. (F 499)

MIDLANDS ELECTRICITY BOARD

APPLICATIONS are invited for the following superannuable posts:—

(1) FIRST ASSISTANT DISTRICT COMMERCIAL ENGINEER, Cannock District, Wolverhampton and District Sub-Area. Salary £699/£725 per annum (N.J.B. Grade "E," 6).

(2) SECOND ASSISTANT DISTRICT COMMERCIAL ENGINEER, Cannock District, Wolverhampton and District Sub-Area. Salary £619/£629 per annum (N.J.B. Grade "E," 8).

Applicants should possess suitable technical qualifications and have had considerable experience in commercial work in the electricity supply industry. Apply, in writing, within 14 days, stating age, experience, present salary and position to Sub-Area Manager, Midlands Electricity Board, 83 Darlington Street, Wolverhampton.

THIRD ASSISTANT DISTRICT ENGINEER, Redditch District, Worcester and District Sub-Area. Salary £587/£600 per annum (N.J.B. Grade "E," 9).

Experience necessary in all branches of distribution work, including construction, operation and maintenance of high and low voltage underground and overhead distribution systems. Technical qualifications desirable. Apply, in writing, within 14 days, stating age, experience, present salary and position, to Sub-Area Manager, Midlands Electricity Board, Whittington, Worcester

DISTRICT COMMERCIAL ENGINEER, Wednesbury District, South Staffs and North Worcs Sub-Area. Salary £905/£944 per annum (N.J.B. Grade "G," 4).

Applicants should have had extensive experience in the industrial and domestic aspects of commercial work, including installations, public lighting and sales and service to the consumer. The duties will include the preparation of technical schemes and estimates and participation in negotiations for the supply of electrical energy. Technical qualifications desirable. Apply, in writing, within 14 days, stating age, training, qualifications, experience, present position and salary to Sub-Area Manager (Ref. CW), Midlands Electricity Board, Toll End Road, Tipton, Staffs.

A. STEPHENS,
Secretary.
(F 537)

INSTALLATION SUPERINTENDENT

REQUIRED by the SIERRA LEONE GOVERNMENT ELECTRICITY DEPT. for one tour of 18-24 months with prospect of permanency. Commencing salary, etc., according to experience in scale £742 rising to £1,177 a year. Outfit allowance £60. Free passages. Liberal leave on full salary. Candidates should have served an apprenticeship in the consumers section of an electricity undertaking and should possess an O.N.C. in electrical engineering. Experience in the installation of power and lighting circuits to comply with I.E.E. regulations is essential. Some experience in the testing of single-phase kWh meters is important.

Write to the Crown Agents, 4 Millbank, London S.W.1, State age, name in block letters, full qualifications and experience and quote M2C/28555/EE. (F 535)

BRITISH ELECTRICITY AUTHORITY

London Division

APPLICATIONS are invited for the following superannuable posts. Salary, including London allowance, and conditions of service in accordance with N.J.B. agreement, Schedule "A." Qualifications entitling to Graduate Membership of the I.E.E. or I.Mech.E. an advantage.

JUNIOR ENGINEERS
Hackney and Stepney* Generating Stations

Good technical training with generating station experience desirable (*opportunity to gain experience on p.f. boilers). General duties in generating station operation. Salary: Class "F," Grade 14, £491 per annum.

Application may be made on form obtainable from Divisional Secretary, B.E.A. London Division, Generation House, Great Portland Street, W.1, and be received within 14 days of this advertisement. (F 502)

FITTER LINESMAN

REQUIRED by the NYASALAND GOVERNMENT ELECTRICAL SERVICES DEPT. for one tour of 24 to 36 months in the first instance with prospect of permanency. Commencing salary, etc., according to experience, in scale £747 rising to £1,103 a year. Outfit allowance £30. Free passages. Liberal leave on full salary. Candidates not over 35 years of age must have had a good general training and considerable experience of the erection, maintenance and testing of overhead distribution up to 11 kV, using steel and wood supports. They should be able to carry out all overhead line work including tensioning, erection of switchgear, transformers, etc.

Write to the Crown Agents, 4 Millbank, London S.W.1, State age, name in block letters, full qualifications and experience and quote M2C/29310/EE. (F 534)

BRITISH ELECTRICITY AUTHORITY

Merseyside and North Wales Division

REQUIRE a STATION SHIFT CONTROL ENGINEER for the Bromborough Power Station, Cheshire. Salary: £641/£687 per annum, N.J.B. Class "H," Grade 10. Superannuable and subject to medical examination. Applicants must have had experience in the control room of a modern generating station. Qualifications entitling the applicant to Graduate or Student Membership of an appropriate Institution will be an advantage.

Application forms may be obtained from the Divisional Secretary, Beaconsfield Road, Woolton, Liverpool. Closing date, November 19, 1953. (F 508)

BRITISH ELECTRICITY AUTHORITY

Midlands Division

GENERAL ASSISTANT ENGINEER (Electrical) is required in the Generation Construction Department at Wolverhampton. N.J.B. service conditions; superannuable appointment; salary in accordance with Schedule "C," Grade 8, commencing in the range of £501 to £639, ultimately rising to £894.

A recognised technical training, including experience in the design and installation of electrical equipment for power stations or industrial works is required. Appropriate technical qualifications an advantage.

Apply on Forms AE6, quoting Vacancy No. 536MD, to the Establishments Officer, 53 Wake Green Road, Moseley, Birmingham 13, by November 21, 1953.

(F 509)

ASSISTANT MANAGER required for electricity showrooms with high-class clientele, in one of main thoroughfares of Glasgow. Previous experience in domestic appliances, radio or television sales essential, and preference given to applicant with technical knowledge and practical electrical training. Applicant should be able to control staff and promote sales. Excellent opportunities of promotion.—Apply, in writing, stating age, experience and qualifications, to Box No. 3021, Electrical Times. (F 526)

ASSISTANT TEST ENGINEER for high voltage testing work. Technical education to at least Ordinary National Certificate standard. Previous electrical testing experience necessary.—Write for interview, giving training and experience, to the Assistant Secretary, The Micanite and Insulators Co., Ltd., Empire Works, Blackhorse Lane, London E.17. (F 512)

CHIEF DRAUGHTSMAN required by Johnson and Phillips, Ltd., for their Australian factory at Liverpool, New South Wales (20 miles from Sydney). Good experience in either electrical control or switchgear essential. Applicant must have real administrative capacity. Excellent opportunity. Adequate salary. Temporary accommodation will be arranged.—Apply by letter to Managing Director, Johnson and Phillips, Ltd., Victoria Works, Charlton, London S.E.7. (F 402)

CROMPTON PARKINSON, LTD. require experienced CONTRACT ENGINEER for handling tenders and orders in respect of composite schemes covering all classes of electrical equipment, including cables, with emphasis on overseas work. Location Chelmsford.—Replies, giving details of age, experience and qualifications, should be sent to 1Co., Crompton Parkinson, Ltd., Chelmsford. (F 493)

DENIS FERRANTI METERS, LTD., Bangor, North Wales, have vacancies for ENGINEERS with experience in the design and manufacture of watt-hour meters and similar mechanisms. Good opportunities in expanding department for men able to work under own initiative. Assistance given in obtaining accommodation. Salary £600 to £750 p.a. (F 510)

DESIGN DRAUGHTSMEN. Design Drawing Office of a leading manufacturer of electric cooking and heating equipment of all descriptions require Draughtsmen who have ability to create and are interested in design and development of new products. Unusual opportunity for a permanent position in factory situated in Home Counties. Modern conditions; pension scheme; five-day week, etc.—Replies, giving full details of experience, training, age and salary required, to Box No. 3025, Electrical Times. (F 528)

ELECTRIC CABLE MANUFACTURER requires SENIOR SALES REPRESENTATIVE for Southern England. Applicants must be experienced and with established connections in the area. State age, experience and salary required.—Box No. 3015, Electrical Times. (F 523)

BOX No. replies to be addressed to the ELECTRICAL TIMES, Sardinia House, Sardinia Street, London W.C.2

ELECTRICAL ENGINEER, experienced in power station installation and commissioning, prepared to work on own initiative. A.M.I.E.E. or equivalent qualification.—Write Box No. E.T.809, c/o 191 Gresham House, E.C.2. (F 492)

ELECTRICAL ENGINEER with engineering degree or equivalent and A.M.I.E.E. required to supervise design group concerned with light and power installations for oil refinery and chemical plant. The successful applicant should have several years experience in a similar capacity and possess first-class leadership qualities. This is a responsible senior position and a commensurate salary will be paid. In addition there are sickness, pension and life assurance benefits.—Applications, giving full details of age, qualifications and experience, should be addressed to Box No. 3023, Electrical Times. (F 527)

ELECTRICAL OR MECHANICAL ENGINEER required for development work on toughened glass power line insulators. Aged 24-27. Higher National Certificate standard with experience in: (a) Drawing Office, with particular reference to malleable castings and small steel parts; (b) strength of ferrous materials; (c) overhead line construction or insulator string design. Previous knowledge of glass not expected.—Applications to Chief Personnel Officer, Pilkington Brothers, Ltd., Head Office, St. Helens, Lancashire. (F 454)

ELECTRICIAN SALESMAN required by Christian firm, to service and install electrical apparatus throughout country and later solicit new business. Must be keen Christian, have good electrical knowledge, appearance and address. Single man under 40 preferred, as away most of week and some week-ends. Good salary, expenses and commission.—Apply in own handwriting, with photo, stating age, experience, present earnings, when free and full personal details, including Christian connection to "F," c/o J. E. May, Ltd., Advt. Agents, 19 Ludgate Hill, London E.C.4. (F 444)

GRADUATE MECHANICAL OR ELECTRICAL ENGINEER for an interesting and progressive post connected with development work on special cables; location, Prescot Works. Candidates should preferably be below the age of 30 with some previous industrial experience, not necessarily with the cable industry. Appointment will be to the permanent staff after the usual probationary period, and remuneration will be in accordance with age, experience and qualifications.—Applications, in the first instance, should be submitted by letter to the Staff Officer, B.I.C.C., Ltd., Prescot, Lancs. (F 517)

JOHNSON AND PHILLIPS invite applications for the appointment of Chief Rubber TECHNOLOGIST to fill a vacancy which will shortly be created by retirement.

Applicants should hold scientific qualifications of university degree or comparable standard and must possess extensive experience in senior capacity of the design and manufacture of rubber and thermoplastic cables with intimate knowledge of materials and compounds.

The duties involve overall responsibility to the Cable Test and Research Manager for all routine technical work relating to rubber cables and materials, and for research and development.

We are prepared to pay a good salary to the right type of man and the position offers excellent pension and insurance prospects.

Applications, giving full particulars of age, education, training, experience and salary suggested, should be sent to Employment Manager, Victoria Way, Charlton, S.E.7, marked "Rubber Technologist." They will all be treated with the utmost confidence. (F 441)

JOHNSON AND PHILLIPS, LTD., require a Chief Switchgear DRAUGHTSMAN for their South African factory. Candidates must have good practical and technical training in addition to experience with leading switchgear manufacturers both in drawing and design offices. Age preferably between 30 and 40 years.—Applications in writing, giving full particulars of training, experience, age and salary required to Employment and Welfare Manager, Johnson and Phillips, Ltd., Victoria Works, Charlton, London S.E.7. (F 440)

JOHNSON AND PHILLIPS, LTD., require a Senior Switchgear Designs DRAUGHTSMAN experienced in the design of l.v. breakers and switchgear up to 30 MVA. Only men having actual design and workshop experience and accustomed to working on own initiative with the minimum of supervision should apply. Vacancy offers good opening to the right man.—Applications, giving full particulars of training and experience together with salary required, to Employment and Welfare Manager, Johnson and Phillips, Ltd., Victoria Works, Charlton, London S.E.7. (F 439)

ELECTRIC WIRING INSTALLATIONS

SENIOR CONTRACTS ENGINEER

required for
an Electrical Contracting Company in

EAST AFRICA

Must be experienced in the supervision of a Contracts Department covering in particular industrial installations and multi-storied buildings, and be capable of preparing estimates and schemes. Salary and allowances approximately £1,100 to £1,400 per annum depending on experience, also

CONTRACTS FOREMAN

for the above company. £750 to £950 per annum, depending on experience.

Apply to Balfour, Beatty and Co., Ltd., 61 Queen Street, London E.C.4. (F 491p)

LIGHTING ENGINEER with experience in street lighting lantern design required to take charge of street lighting activities of leading lamp and fittings manufacturers. Excellent opportunity for the right man.—Write in confidence to Box A.912, Central News Ltd., 17 Moorgate, London E.C.2. (F 516)

PLUMBER JOINTERS (Power Cables) required for temporary employment abroad. Selected applicants may be given additional training in this country before proceeding overseas. Good prospects for regular employment on home establishments for fully satisfactory men who are available for further foreign service as required. Standard rates when on home service, excellent remuneration when overseas. Write, stating age, experience, etc., to Labour Officer, 60 Hillmarton Road, London N.7. (F 542)

REPRESENTATIVE of outstanding ability required for North Western postal districts of London by a leading electrical engineering company. Applications will only be considered from experienced men with a connection in the lamp and electrical industry.—Write, with full details of age, experience, qualifications and salary required, to Box 7144, c/o Charles Barker and Sons, Ltd., 31 Budge Row, London E.C.4. (F 515)

SALES REPRESENTATIVE required by leading electrical manufacturer, experience in selling high-class products, including E.L.M.A. lamps and C.M.A. cables. Area Black Country and Shropshire. Should reside in or around Wolverhampton. State if car owner.—Full details in application to Box No. 7143, c/o Charles Barker and Sons, Ltd., 31 Budge Row, London E.C.4. (F 514)

SALES REPRESENTATIVE required for Swansea area by electric cable manufacturers. Preference given to applicants who have established connections. State age, experience and salary required.—Box No. 3017, Electrical Times. (F 524)

SANTON, LTD., invite applications by letter only for a JUNIOR REPRESENTATIVE in the Eastern Electricity Board area.—Applications, which will be treated confidentially, to the London office, East Acton Arcade, Old Oak Common Lane, Acton, London W.3. Tel.: Shepherds Bush 3311. (F 520)

SURVEYORS AND ASSISTANT ENGINEERS required on contract works in South Wales. Overhead line experience an advantage. Pension scheme.—J. L. Eve Construction Co., Ltd., 17 Hill Side, London S.W.19. (F 490)

SWITCHGEAR ESTIMATOR for South Africa, Johnson and Phillips, Ltd., require a Switchgear Estimator for their South African factory. Duties include handling inquiries and preparation of estimates for locally built and/or imported switchgear and components. Young man required, preferably single. Applicants should possess sound practical training supported by good technical education. Good prospects and salary for the right man.—Applications, giving full particulars of age, training and experience, to Employment Manager, Johnson and Phillips, Ltd., Charlton, London S.E.7. (F 455)

Engagement of persons must be made through a Local Labour Office or Scheduled Employment Agency, if the applicant is a man aged 18-64, or a woman aged 18-59; unless the person concerned is excepted or the employment is in a managerial or professional capacity, or is otherwise excepted from the provisions of the Notification of Vacancies Order, 1952.

THE ENGLISH ELECTRIC CO., LTD., at Liverpool offer opportunities for young, fully trained and qualified ENGINEERS to work on electric domestic appliance design and development. There are interesting vacancies open in this highly competitive and progressive field for men with initiative and new ideas—experience of domestic appliances, whilst being an advantage, is by no means essential. Assistance will be given in housing the successful candidates.—Apply in confidence to Dept. C.P.S., 336-7 Strand, W.C.2, quoting Ref. 452G. (F 519)

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INDEX TO ADVERTISERS

Aberdare Cables, Ltd. 86
Aidas Electric Co., Ltd.... ... 77
Arora Co.... 22
Arrow Electric Switches, Ltd. ... 5
Astor Boisselier and Lawrence, Ltd. 76
Astral Equipment, Ltd. 30
Austinlite, Ltd. 18
Bakelite, Ltd. 25
Bayliss, Jones & Bayliss, Ltd. ... 19
B.B. Chemical Co., Ltd.... ... 22
Benjamin Electric, Ltd. 2
Berry's Electric, Ltd. 43
Birmingham Aluminium Casting (1903) Co., Ltd. 33
Bray George & Co., Ltd. ... 36
British Driver-Harris Co., Ltd.... 46
British Electricity Authority ... 79
British Insulated Callender's Cables, Ltd. 39
British Physical Laboratories ... 70
British Thomson-Houston Co., Ltd. 1, 51
Brook Motors, Ltd. 14
Brush Electrical Engineering Co., Ltd. 29
Burco, Ltd.... 7
B.V.C. Industrial Constructions, Ltd. 17
Cable Makers' Association ... 71
Chance Bros. 18
Channel Conduits, Ltd.... ... 76
Chilton Electric Products, Ltd.... 84
Clang, Ltd. 42
Connollys (Blackley), Ltd. ... 52
Cooper & Co. (Birmingham), Ltd. 72
Copper Development Association 28
Cressall Manufacturing Co., Ltd. 4
Critchley Bros. Ltd. 8
Crockatt, W., & Sons, Ltd. ... 22
Dussek Bros. & Co., Ltd. ... 50
D.S. Plugs Ltd,. 26
East London Mica Works ... 26
Edison Swan Electric Co., Ltd.... 49
Eeto Insulations 78
Ekco-Ensign Electric, Ltd. ... 83
Enfield Cables, Ltd. 23
English Electric Co., Ltd. 34, 35, 44, 81
Falk, Stadelmann & Co., Ltd. ... 37
Ferranti, Ltd. 53
Fluxite, Ltd. 70
Fry's Metal Foundries, Ltd. ... 54
General Cable Manufacturing Co., Ltd. 12
General Electric Co., Ltd. 6, 56, 75
Grelco, Ltd. 82
Hardy & Padmore, Ltd.... ... 8
Hedin, Ltd. 38
Henley's W.T., Telegraph Works Co., Ltd. 57, 82
Higgs Motors, Ltd. 10
Hivac, Ltd. 42
Johnson & Phillips, Ltd.... 31, 48
Kempston Electrical Co., Ltd. ... 80
Low, Duncan, Ltd. 38
Lyons, Claude, Ltd. 46
Martindale Electric Co., Ltd. ... 36
Mather & Platt, Ltd. 78
Metropolitan-Vickers Electrical Co., Ltd. 21
Midland Electric Manufacturing Co., Ltd. 67
Midland Silicones, Ltd. 32
Morley's Electrical Services, Ltd. 18
Nevelin Electric Co., Ltd. ... 16
Nife 3atteries, Ltd. 3
Oddie, Bradbury & Cull, Ltd. ... 80
Parmiter Hope & Sugden, Ltd.... 85
Pilkington Bros., Ltd. 15
Pope's Electric Lamp Co., Ltd. 13
Quadrant Meter Co., Ltd. ... 70
Rainsford & Lynes, Ltd.... ... 74
Resistances, Ltd. 42
Reyrolle, A., & Co., Ltd. ... 11
Rheostatic Co., Ltd. 27
Rowlands Electrical Accessories, Ltd. 68
Runbaken, Ltd. 82
Sanders, Wm., & Co. (Wednesbury), Ltd. 38
Sangamo Weston, Ltd. 58
Sax, Julius, & Co., Ltd. 46
Scott, Hugh J., & Co. (Belfast), Ltd. 4
Serck Tubes, Ltd. 80
Sherwood Transfer Co. 70
Simmonds & Stokes (Niphan) Ltd. 74
Simon-Carves, Ltd. 9
Smart & Brown (Engineers), Ltd. 72
Smiths Industrial Instruments, Ltd. 4
Standard Telephones & Cables, Ltd. 45
Sturdy Electric Co., Ltd. ... 82
Sutcliffe Speakman & Co., Ltd.... 69
Symons, H. D., Co., Ltd. ... 69
Thew, Edward H., Ltd. 65
T.M.C.-Harwell (Sales), Ltd. ... 73
Tudor Accumulator Co., Ltd. ... 20
Universal Boilers & Engineering Co., Ltd. 47
Volex Electrical Products, Ltd. 40, 41
Washers, Ltd. 80
Westinghouse Brake & Signal Co., Ltd. 24
West Insulating Co., Ltd. ... 78
Whitefield Machinery & Plant Ltd. 78
Wootton & Co., Ltd. 30

(Continued from page 65)

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11,505	
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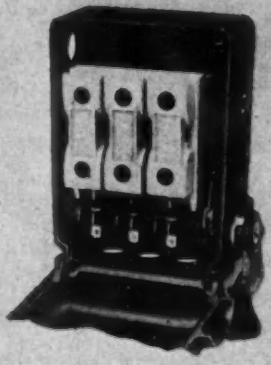

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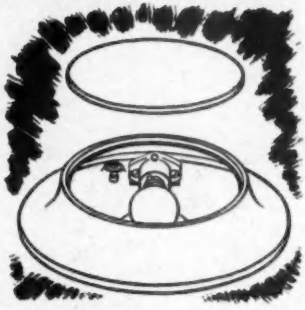

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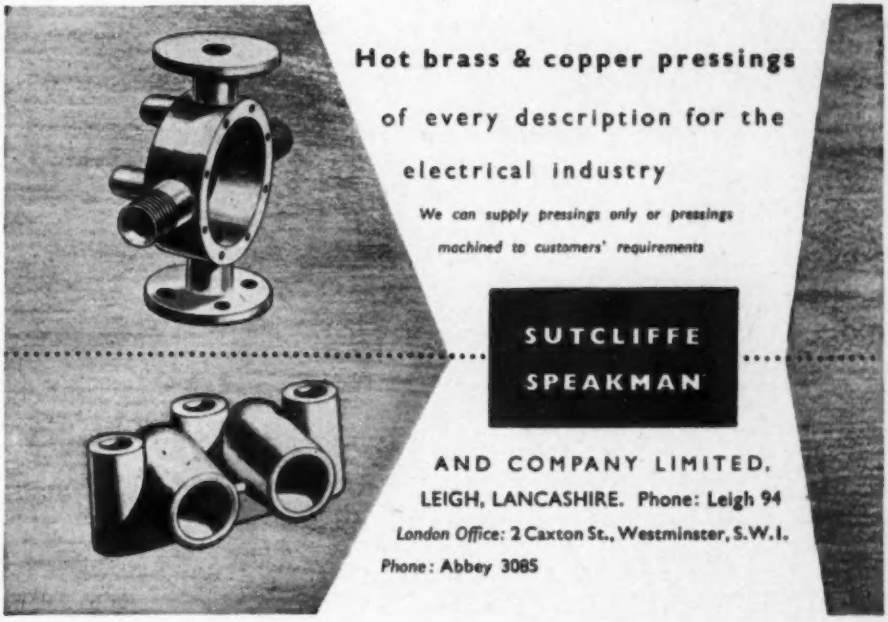

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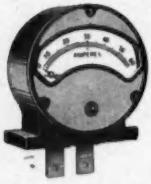

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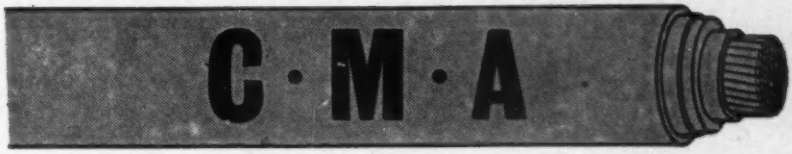

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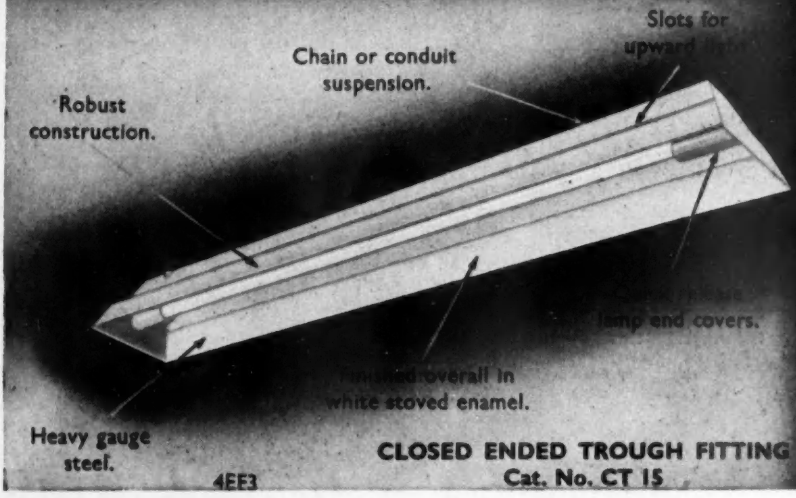

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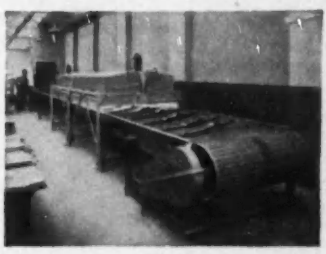
● G.E.C. has had many years' experience in the design and construction of heating plant. The company's specialists welcome opportunities to discuss potential uses with engineers and metallurgists.

Infra-Red Heating



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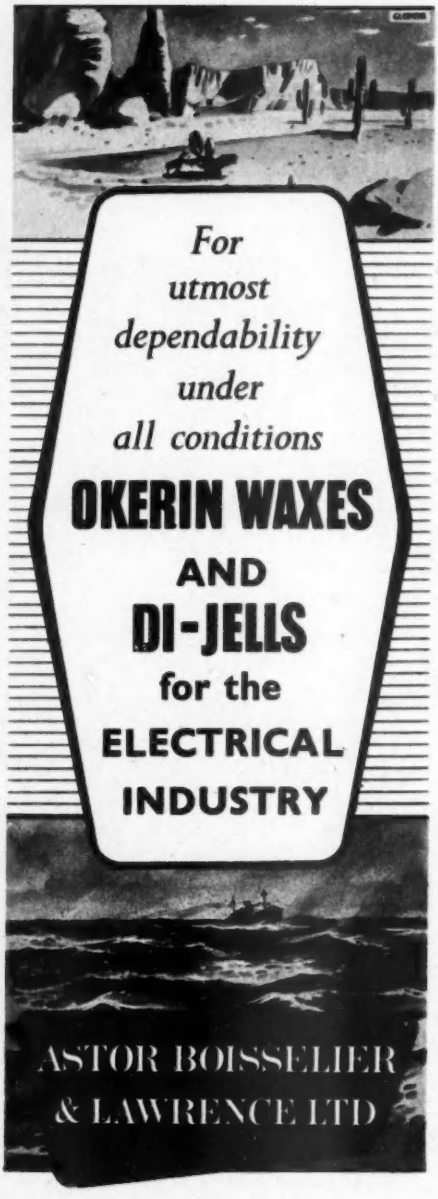

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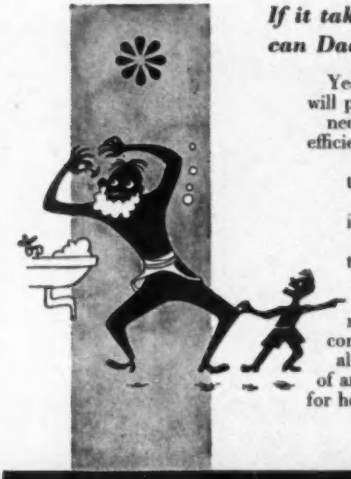
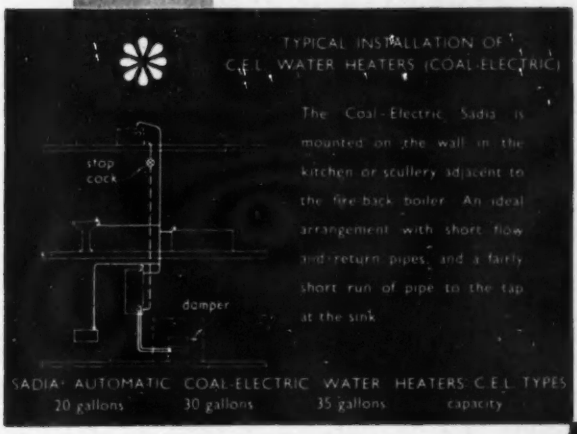
Current Hot Water Problems



If it takes two tons a term to heat a home — can Dad have* hot water *every morning?

Yes, indeed—a Sadia Coal Electric Water Heater will provide the family with *hot water* whenever they need it. The Sadia stores the fire-heated water efficiently, preventing heat loss. When the fire has been out for some time, or in the summer months, the Sadia automatically heats the water to a predetermined temperature . . . in short it is superbly efficient and economical in operation. Architects and builders will particularly appreciate the simplicity with which Sadia is installed—no complicated piping to make heavy demands on materials and man hours. And of course there are no fumes or flues to bother about; the Sadia is a compact self-contained unit. Our expert engineers are always ready to discuss with you the installation of any type or size of Sadia Electric Water Heating Unit for household or business use.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20 gallons 30 gallons 35 gallons capacity

Efficient cork insulation. Welded copper tank, tested to 100 lbs. per sq. inch. Sheet steel container, stove enamel finish. Automatic thermostat control.

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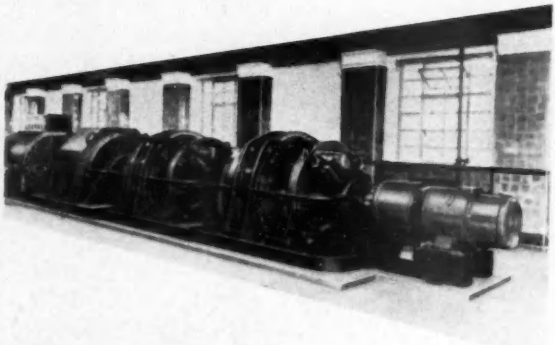
Turbine Driven Through Gears

The generating set illustrated is installed in a paper mill in the North of England. A 3,750 kVA alternator is coupled to two 625 kW D.C. generators driven through gears by a passout steam turbine.



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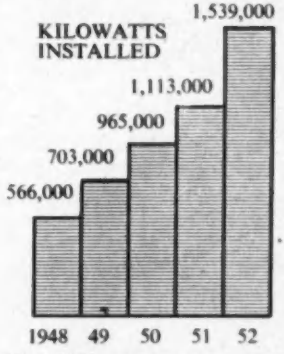
A vast potential electricity supply is available for more electric cooking and water heating, as well as for industry, agriculture, and other purposes. Increased use of electricity in different ways helps to develop a balanced load on the power stations and makes for increased prosperity, cheaper goods, and a higher standard of living.

Five years' Progress

In the five years since British Electricity came into being, record amounts of new generating plant have been installed each year.



The 1952 figure was more than twice the pre-war record of 759,000 kilowatts.

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SIMPLE — POSITIVE — SELF LOCKING
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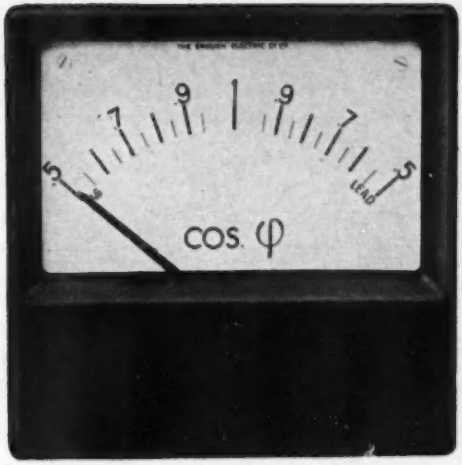
Simple Mounting Arrangement



CASE

round flush
round projecting
square flush
square semi-protected

SCALE

0·5 lag — 1 — 0·5 lead
0·2 lag — 1 — 0·8 lead

SUPPLY

Single phase
Three phase (balanced load)

VARMETERS ALSO AVAILABLE

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WORKS: STAFFORD · PRESTON · RUGBY · BRADFORD · LIVERPOOL · ACCRINGTON
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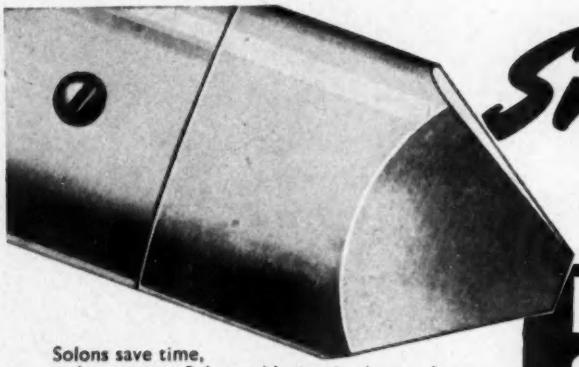
See also the English Electric advertisements on pages 34, 35 and 44 of this issue



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Solons save time, reduce costs. Solon soldering is always clean, reliable and simple. Five models, in voltage range 100-250 ; each with 6 feet Henley flexible.
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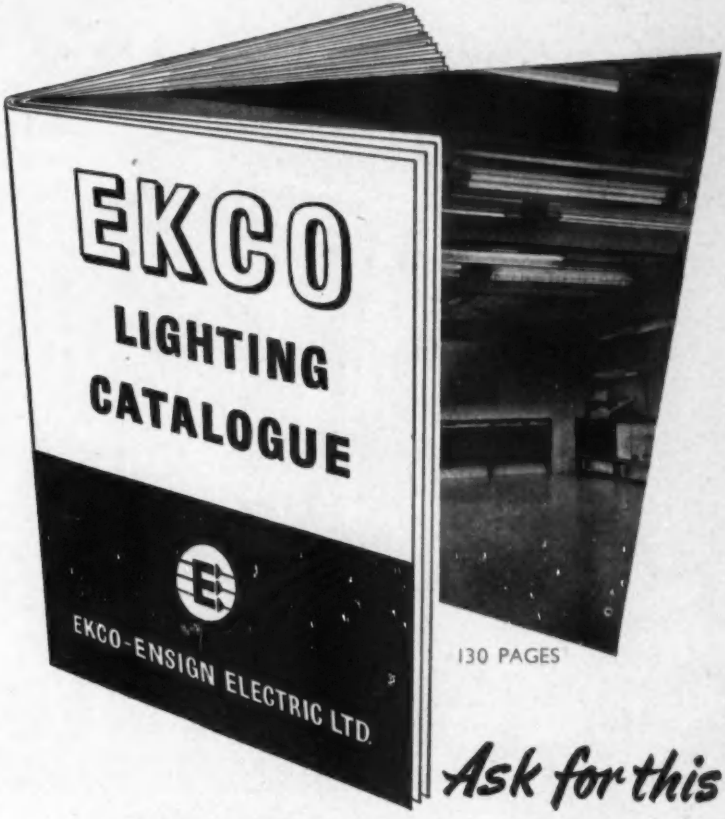

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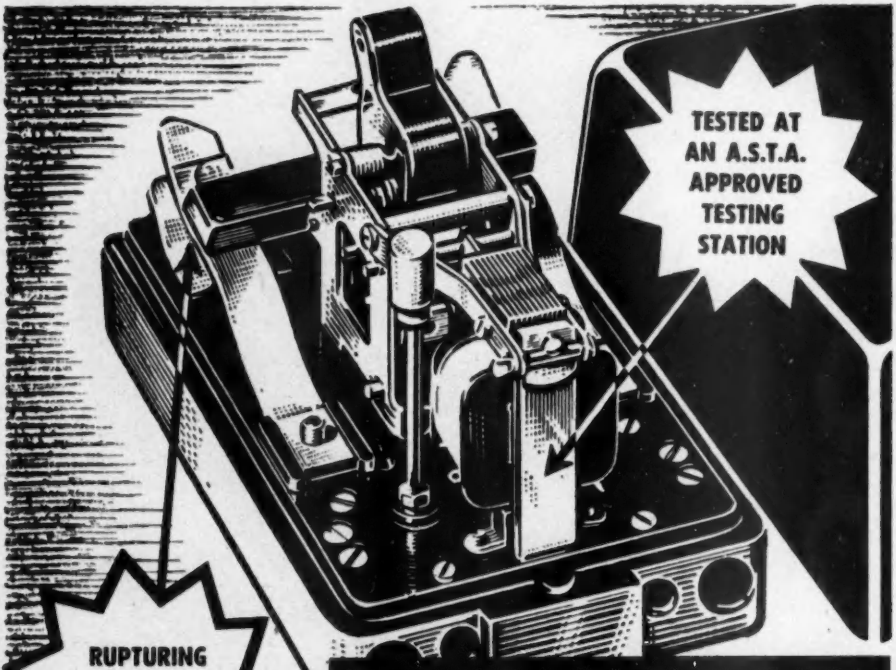

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RUPTURING CAPACITY 2,500 AMPS. 250V.

ELT/B. Sound design and special production methods make this type the least expensive and most efficient combined overload and earth leakage circuit breaker on the market.

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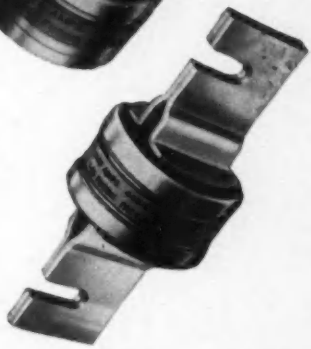
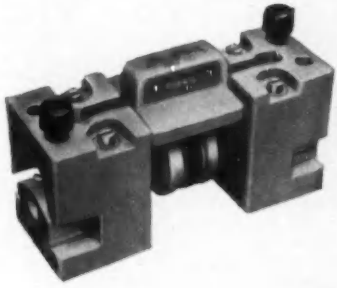
Aeroflex
HOPE'S PATENTS



CERAM FUSES and CONTACTS



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